HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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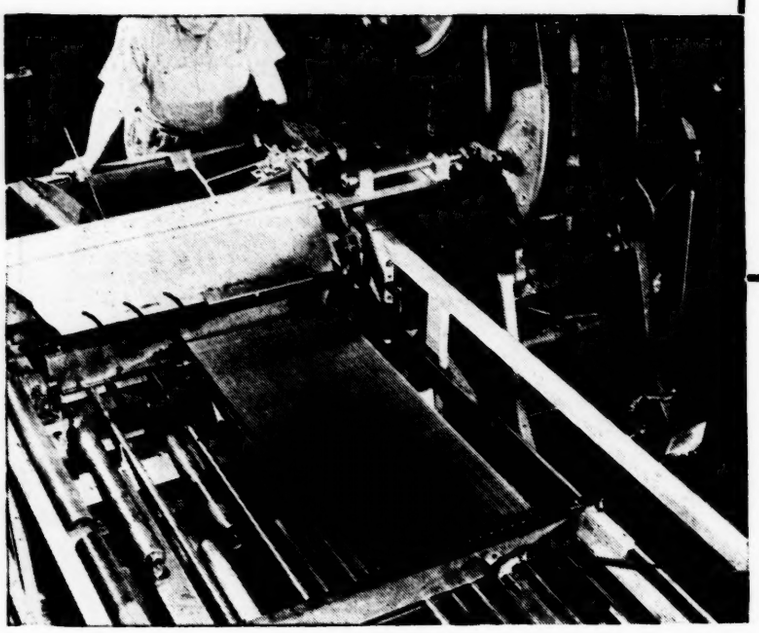
The INDUSTRIAL PRESS

THIS MONTH'S COVER

Manifold arrangement of three 6-inch Grimes alarm valves that serve 21 floors and basement in the 40-story loft building being completed at 1407 Broadway, New York City. Structure is believed to be the tallest automatic sprinklered installation in the world. Photograph, courtesy Raisler Sprinkler Division, Raisler Corp., New York, N. Y.

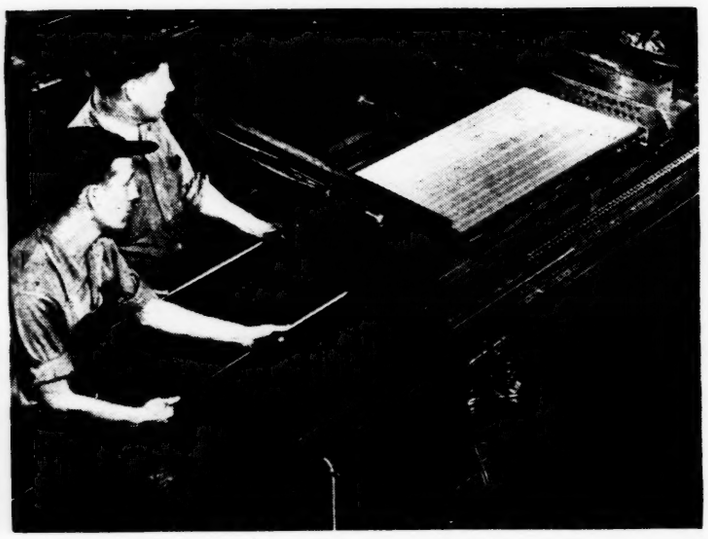
In cooling or heating coils

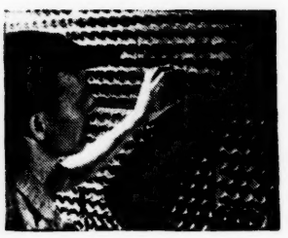


Specially-designed fin punching and stacking machinery makes possible high production along with high quality.

Sturtevant

GIVES YOU PROVEN PERFORMANCE





Uniformity of workmanship, quality, and performance are built into every Sturtevant coil.

Proper expansion of tubes provides best heat distribution to finned surfaces.

Washington News

LORING F. OVERMAN

THIS is where I came in, may well be the reaction of any who are more than casual readers of this particular column in HEATING AND VENTILATING.

For *Washington News* began with World War II. Initial purpose of the column was to keep readers informed about the growing "defense program" and its needs for heating, ventilating and air conditioning equipment. Later, the column told a story strange to Americans—a story of priorities, allocations, price controls, and the 1001 directives under which business, industry and civilians operated during years of war with Italy, Germany and Japan.

How short a time it seems since this column enthused over VE-day and VJ-day, and the peace that was to last, this time, forever!

Here We Go Again

Strangely enough, the eruption in Korea found our country just as much off guard as did the Japanese sneak attack at Pearl Harbor. And far less prepared, it appears, despite the expenditure of billions of dollars yearly for defense. If the world needs proof that America does not have warlike intentions, Pearl Harbor and Seoul should offer plenty of evidence that we don't even know what to expect. Pearl Harbor was "too strong" for an enemy to attack—yet one did. And Korea, our experts said, was "indefensible"—yet we are committed to its defense. Or to its recapture if—as seemed not impossible as July neared to an end—our meager forces were unable to hold a peninsular position accessible only by air and water.

To those who maneuver us into such red-faced positions as Berlin, with no communication line of our own, and Korea, without even behind-the-lines airfield, our initial writhings in the clutches of war must indeed appear amusing. It remains to be seen how long it will take for the tables to be turned.

New Kind of War

There are indications, unfortunately, that the military operation to which we are now committed will be unlike anything this country has ever seen.

Instead of the kind of war this country prefers—a quick one-two punch, get it over with, and get back to work and play—there are indications that we may face years of armed sparring. Costly in lives, money, materiel, and spirit, such a drawn-out period of hostilities might find us in a poor position to meet a knock-out try by a waiting, watching foe.

In Washington there are several viewpoints as to the possible duration, and extent, of current and possible hostilities. All observers are agreed that Russian Communism is the real enemy. Only a few believe that when the United States shoots down the Korean trial balloon, Russia will pull in its horns until it feels better prepared for an all-out war with the United States.

By far the greater number of observers here believe that while Russia may have been surprised at the speed with which the United States started shooting, the knowledge that Uncle Sam will shoot at small targets is right in line with Red planning. Thus, the theorizing goes, the Reds will pull the puppet strings in various parts of the world, and Uncle Sam and his police force will soon be scattering its military power to the four winds; simultaneously draining the home front of men, money, and defense armaments.

You Pays Your Money

You may take your choice as to the type of hostilities you see ahead, but you will be given little choice on the subject of paying your money.

In his message to Congress, outlining the gravity of the situation and demanding remedial action, President Truman requested an initial commitment of 10 billion dollars a year.

And in a broadcast on July 23, Senator Taft observed that the present condition may last "perhaps 10 or 15 years" and should therefore be financed on a pay-as-you-go basis.

"An additional 10 to 15 billions a year over the present level of 13 billions for military, plus perhaps some additions for foreign aid, will take the budget up from around 40 billions a year to above 50 and perhaps to 60 billions," Senator Taft said. "And since this is not a temporary condition but one that may continue indefinitely, we should tax the people for the whole cost."

All-out mobilization at a cost of up to $150,000,000,000 a year would be another thing, the Senator said, and it would not be possible to try to pay such a bill at once.

Legislation Requested

In addition to his request for 10 billions of dollars to start the United States on the road back to preparedness, the President requested legislation:

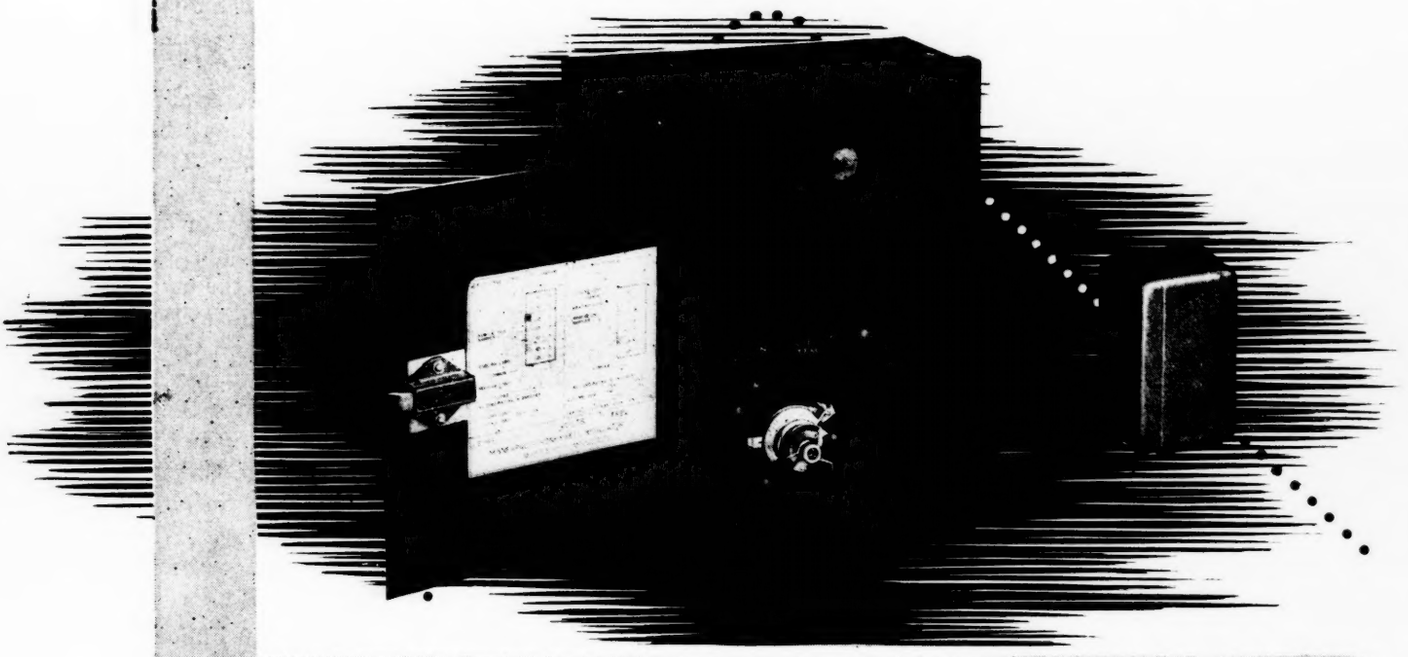
(1) To remove the statutory limits on the size of the armed forces;
(2) To authorize use of priorities and allocations of materials to meet defense needs;
(3) To limit use of materials for non-essential purposes;
(4) To prevent inventory hoarding;
(5) To authorize the requisitioning of supplies and materials needed for national defense, particularly supplies held in excess, and unnecessary inventories;
(6) To control consumer credit and credit used for commodity speculation, and
(7) To authorize production loan guarantees and loans to increase defense production.

Bills Introduced

To implement the President's requests, identical versions of the Defense Production Act of 1950 have been introduced in both houses of Congress. The Senate

THE NEW HONEYWELL OUTDOOR CONTROLLER

Cyclotrol . . . An Electronic Control Package for Burner and Zone Valve Control—Provides Automatic Night Shutdown and Morning Pickup—Low in Cost—Simple to Install—Saves Fuel



A REAL FUEL SAVER FOR APARTMENTS, HOTELS AND COMMERCIAL BUILDINGS

HERE'S a new Honeywell Electronic Outdoor Control package that affords great fuel economy and can be easily installed by any workman. Especially designed for apartments, hotels and commercial buildings, this new control automatically determines the length of both the on and off periods in accordance with outdoor weather conditions, rather than the conventional fixed time cycle. Being electronic it is supersensitive, fast in response and has no moving parts. It is low priced, easy to install, easy to adjust and, above all, it saves fuel. Investigate this new Honeywell outdoor controller at once. Then recommend and install it for your clients.

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CONTROL SYSTEMS

77 BRANCHES FROM COAST TO COAST WITH SUBSIDIARY COMPANIES IN: TORONTO • LONDON • STOCKHOLM • AMSTERDAM • BRUSSELS • ZURICH • MEXICO CITY

bill, is designated as S3936; the House version as H.R. 9176.

Many members of Congress are hesitant about voting the President the standby powers provided by the Defense Production Act of 1950, but it is generally conceded that bucking "the war effort" will become more unpopular than voting controls. So it appears that the nation is indeed headed back into that maze of restrictions and regulations from which it had just about extricated itself.

It is anticipated that at first the controls will involve only metals and scarce chemicals. Biggest customers for metals are automobiles, construction, containers, and railroads. The President already has the power, through certain provisions of the Draft Act, to direct the flow of steel, but specific instructions are sought to extend the control to other materials. During World War II, the Controlled Materials Plan proved that close control over steel, copper, and aluminium amounted to virtual control over industry itself. The current program will start from this premise, and spread, as conditions permit, "as only government activities can."

Housing Credit Limited

The government needed no additional authority to put the squeeze on construction, the No. 2 user of steel. (Autos took 20.5% of the steel products shipped in May; construction 12.2%; containers 8.5% and railroads 6.8%). By the simple device of making it more difficult for prospects to buy construction, particularly housing, the government not only saves the steel going into building itself, but that going into such accessories as refrigeration, heating and ventilating equipment, air conditioning units, plumbing and the like.

Directives sent out by the Federal Housing Administration and its branches pared down government mortgage insurance, increased down payments required on new houses, and limited starts in the field of public housing.

Prior to the issuance of the directives, it had been anticipated that 1,250,000 housing starts would be made this year. In the first six months the total had reached 687,000 starts, and new records were in sight.

The first action to conserve materials by trimming the housing program authorizes FHA to increase its mortgage authorizations during 1950 by only $650 million, half the amount approved by Congress in the Housing Act of 1950.

Raising of the required down payment was accomplished by several means. First, for purposes of appraising property for mortgage insurance, the construction cost as of July 1, 1950 is taken as the ceiling. Next, veterans will no longer be able to get 100% home loans from the government. A payment of at least 5% is required. For non-GI FHA borrowers, the mortgage insurance allowable on a property is cut by 5%, increasing by that amount the sum which the buyer must raise. The maximum mortgage on one to four-family units is reduced from $16,000 to $14,000.

Also, FHA is directed to require a 10% down payment on repair and modernization loans, effective August 1.

One of the most drastic cuts will take place in the field of public housing, the new program just getting under way. Housing Administrator Foley has been asked to limit starts in the second half of the year to 30,000 dwelling units. Up to June 30, somewhat more than 3,000 units had been started, and the Public Housing Administration expected to have approximately 50,000 under construction by the end of this year. The Housing Administrator has been asked to reappraise the entire public housing program.

Of considerable interest to the heating, ventilating and air conditioning industries is the suspension of direct loans to educational institutions for student and faculty housing. Congress had authorized $300 million for such loans, but no commitments have been made.

In addition to specific instructions, the HHFA and the Veterans Bureau were asked by the President to take such further actions as may be necessary to curtail the use of materials needed for defense. Final housing-affiliated agency to get instructions was the Federal National Mortgage Association, the federal secondary market for FHA and VA mortgages. This agency (Fannie Mae) was instructed "to make sure that further mortgage purchases are held to the irreducible minimum."

Military Requirements

There appears to be little doubt that it will get more and more difficult to do business with civilians. One may as well, then, find out again about military requirements, and how to handle them. According to defense officials, those who want to know how to do business with Uncle Sam's military men should get copies of three booklets.

Booklet No. 1 is "Follow Me, a Guide for Selling the United States Air Force." It can be obtained free by writing the commanding general of the Air Materiel Command at Wright Field, Dayton, Ohio.

Booklet No. 2, "Selling to the Navy," may be purchased for 15 cents, at the Government Printing Office, Washington 25, D. C.

No. 3, the Army Booklet, "Purchased Items and Purchasing Locations," can be obtained free by writing the Procurement Information Center of the Army, at the Pentagon Building, Washington, D. C.

The three booklets list the 55 procurement centers throughout the United States, and tell what items each will buy.

Suppliers should arrange with the proper procurement offices to be notified whenever that office is buying products which the firm manufactures. Requests to be placed on classified list to receive notifications to bid may be filed by mail. A firm may also request that its name be placed on a list to receive a consolidated listing of all items on which the military is seeking bids. This list is compiled daily and is mailed to some 1,500 locations throughout the 48 states. A Commerce Department office in one of 48 major cities will have a copy of the list.

The bid lists do not cover classified (secret) material. Firms desiring to manufacture such items must first make arrangements with the Defense Department to have employees cleared for security. After this has been completed, the firm will be invited to bid or negotiate contracts.

BRIEFLY STATED

• California ranked first among the states in the total value of new construction during the first quarter of 1950, retaining the lead which it has held since 1941, according to a report released by the Construction Division, U. S. Department of Commerce. New York was second in the volume of new construction and Texas ranked third.

• Under way is a survey by the National Tool and Die Manufacturers Association of the products and services offered by the contract shops in the special tool and die industry, to collect the data needed for mobilization planning of that industry.

• New York City's Bureau of Smoke Control has drawn up new regulations for smoke control in that city. The tentative regulations will come up for public hearings after comments and recommendations have been made by various groups, engineering, business, realty and civic.

• Guy B. Panero, Engineers, has been selected by Societa Generale Immobiliare to perform engineering services for one of the largest hotels to be constructed in Rome since the end of the war. The entirely air conditioned 11-story hotel will contain 415 guest rooms and suites in addition to a residential wing that will contain 62 apartments.

• One of the first detailed studies ever made in the country of the growth patterns of metropolitan areas will be undertaken by the Scripps Foundation, Miami University, Oxford, Ohio, under the sponsorship of the Housing and Home Finance Agency. These studies will be made under a research agreement between the new Division of Housing Research of the HHFA, which is launching the program created in the Housing Act of 1949.

• Current shortages and increasing requirements for benzene and phenol have induced the Bureau of Mines to undertake an investigation of these and other chemicals available in producing synthetic liquid fuels from coal and oil shale.

• W. C. Newberg, president of the Airtemp Division of Chrysler Corporation, announced that during the first six months of 1950 Airtemp did a larger volume of business than during the entire six years before the war—1936-1941.

• To eliminate the "rule-of-thumb" in heating design and installation, The Institute of Boiler and Radiator Manufacturers is now sponsoring a School of Modern Heating in dozens of cities throughout the East, South, and Midwest. Begun in Springfield, Mass., in April of this year, the traveling school has been set up for 3-day periods in metropolitan centers in 12 states. Instructor is Arthur L. Wales, field training director for the institute.

• New York's newest skyscraper, the Massachusetts Mutual Life Insurance Company Building, will be completely air conditioned by means of a rooftop installation of four new Carrier steam-operated absorption machines. Each will have a capacity of 275 tons. These are the first units to be produced with a capacity beyond 200 tons, and similar models will range up to 350 tons.

• The Incinerator Institute of America was formed on June 19, 1950 for the purpose of furnishing information on the products of its industry to architects, builders, municipalities, and the public. The institute will concern itself with development of standard performance specifications and will cooperate in the writing of ordinances and regulations. The office of the institute is at 420 Lexington Avenue, New York 17, N. Y., and the secretary-treasurer is Stewart N. Clarkson.

• Two weeks free use can be had of a specially designed and contrived heat flow testing device for determining performance of various kinds of insulation. The offer is made by Infra Insulation, Inc., New York City. Testing device can be operated by non-technical personnel. It needs only to be set on a desk and plugged into ordinary house current. Various forms of insulation, including multiple sheets of accordion aluminum, mineral wool, and others, are provided.

• A two-year contract between the Housing and Home Finance Agency and Tuskegee Institute will extend Tuskegee's research covering production of homes in rural areas for small cash outlay. The contract calls for complete documentation of experience in construction of ten or more experimental dwellings by a cooperating group of low income rural families using family labor and local raw materials.

• Extension of the period in which local communities may make application for capital grant reservations for slum clearance and urban redevelopment projects was announced by HHFA. Applications for projects to be initiated prior to July 1, 1951 will now be received until September 31, 1950.

• 140 students from 20 states attended the fourth short course on hot water and steam heating systems at the University of Illinois, June 13 to 16.

• Westinghouse Electric Corp. has completed a quarter-million-dollar construction program which has placed Westinghouse East Pittsburgh plants well within the limits of the Allegheny County smoke abatement ordinance. New construction included rebuilding and replacing of parts of boilers and incinerators.

Data Binder

A loose-leaf binder containing reprints of 112 pages of recent Data Sheets and Reference Sections, with space for filing material from forthcoming issues of HEATING AND VENTILATING, is available to current subscribers at a price of $1.50. Because of the limited supply, only one copy can be furnished to a subscriber. In sending your request, please use the same name and address to which your subscription is mailed. Please address Book Dept., HEATING AND VENTILATING.

Scrapbook of Exhaust Hood Design

Kirsten Pipe Co., and Archer Blow Pipe Co., Seattle, Wash.

JOHN M. KANE

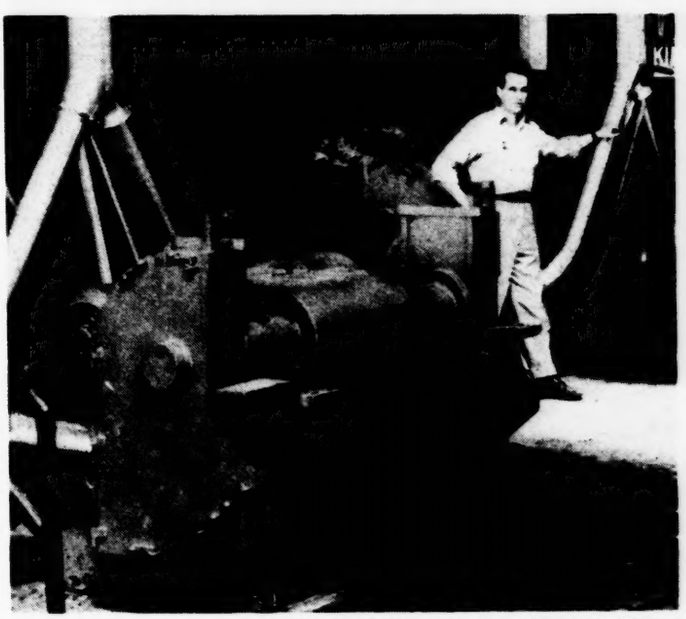
Chief Engineer, Dust Control Division, American Air Filter Co., Louisville, Ky.

Here is a practical approach to the design of exhaust hoods installed for polishing, buffing and grinding operations. Photographs show actual installations and clarify the design and installation data.

EXHAUST hood construction for polishing and buffing has been practically standardized for the finishing of usual size parts. The grinding wheel hood is of heavy construction to act also as a guard in case of wheel breakage. The trap is incorporated in the lower part of hood, Fig. 1, to prevent small parts and large chips or fins from being carried through the exhaust system. Horizontal spindle disc grinder hooding necessitates opening of side of hood sufficiently to allow contact of work with the wheel. However, rotation of wheel tends to throw dust and sparks downward and the control is good where hood edges extend beyond the wheel face.

Polishing hoods for abrasive coated wheels, and buffing hoods are normally of lighter construction and require greater adjustment features due to the greater variation in wheel sizes, parts finished, and the movement of the part at numerous angles to the wheel periphery to get the finish desired. Buffing hood, Fig. 2, is a standard design suited for considerable variation in product buffed. Included in the lower section is a trap to catch greasy clumps of lint that could otherwise clog the exhaust ducts.

When polishing with abrasive coated wheels, trap protection in the hood is of less importance and hoods do prove effective. In some designs the buffing hood has a hinged side, hinged top, and sliding trap clean-



International Harvester Co., Memphis, Tenn., and Kirk & Blum Mfg., Cincinnati, Ohio.

Fig. 1. Typical exhaust hood for usual stand or pedestal grinding.

Mouldings, Inc., and Liberty Eng. Co., Indianapolis, Ind.

Fig. 2. Conventional exhaust hood for buffing operations.

out. It permits buffing of unusual parts with side or top turned back at the expense of less effective control but at the same time provides expected control where side and top can be properly positioned.

Hood designs can be modified for those operations where it is necessary for wheel rotation to be opposite to the usual direction, as indicated in Fig. 3. Where

E. C. Atkins Co., Indianapolis, Ind.

↑ Fig. 3. An illustration of a satisfactory hood design where the wheel rotation is away from the operator.

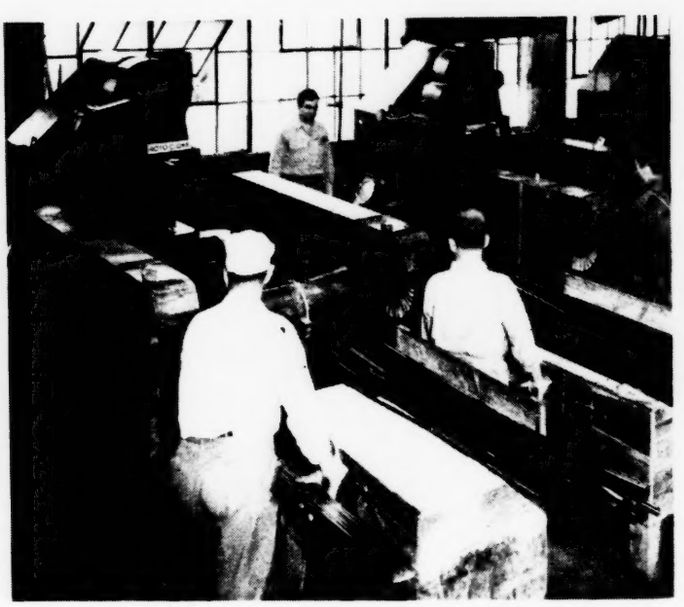
Fig. 4. This type enclosure is recommended for the → finishing of long strips or tubes.

TABLE 1 — EXHAUST REQUIREMENTS FOR GRINDING, POLISHING, BUFFING, SCRATCH BRUSHING, ABRASIVE CUT-OFF WHEELS, GRINDING AND POLISHING BELTS.

Air Volume, 4,500 fpm in all branches; 2-inch suction at average hood

Wheel Diameter, Inches	Max Width*, Inches	Branch Diameter, Inches	CFM
Grinding or Cut-off Wheels			
Through 9	1½	3	225
Over 9 through 16	2	4	390
Over 16 through 19	3	4½	500
Over 19 through 24	4	5	610
Over 24 through 30	5	6	880
Over 30 through 36	6	7	1,200
Buffing, Polishing and Scratch Brushing			
Through 9	2	3½	300
Over 9 through 16	3	4½	500
Over 16 through 19	4	5	610
Over 19 through 24	5	5½	740
Over 24 through 30	6	6½	1,040
Horizontal Single Spindle Disc Grinders			
Through 12		3	225
Over 12 through 19		4	390
Over 19 through 30		5	610
Over 30 through 36		6	880
Horizontal Double Spindle Disc Grinders			
Through 19		1—5	610
Over 19 through 25		1—6	880
Over 25 through 30		1—7	1,200
Over 30 through 53		2—6	1,760
Over 53 through 72		4—8	6,240
Vertical Single Spindle Disc Grinders			
Through 20		1—4½	500
Over 20 through 30		2—4	780
Over 30 through 53		2—6	1,760
Over 53 through 72		2—8	3,120
Grinding and Polishing Belts			
To 3-inch wide, 3-inch branch. Add ½ inch to branch diameter for each 2-inch or fraction increase in belt width over 3-inch.			

*Increase branch diameter 0.3 inch. but not less than ½ inch for each 1 inch increase in width over dimensions noted.

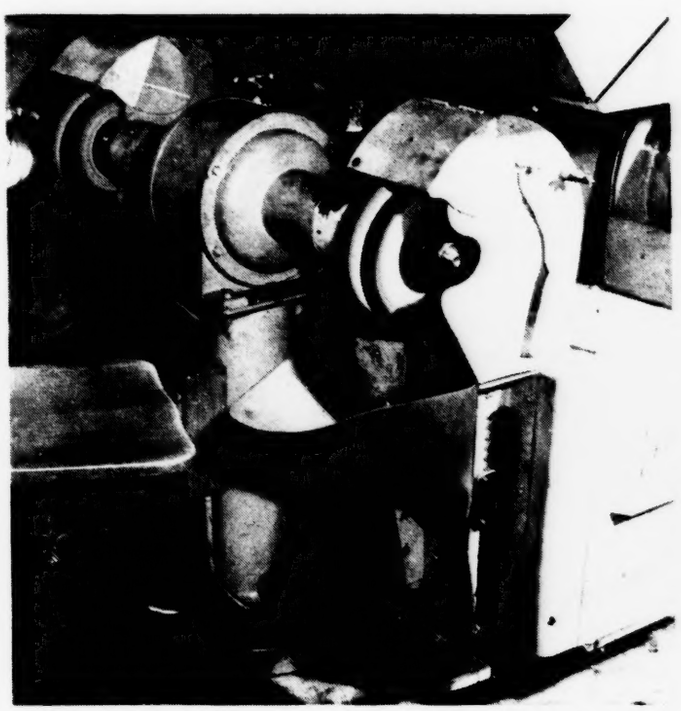


Mouldings, Inc., and Liberty Eng. Co., Indianapolis, Ind.

E. C. Atkins Co., Indianapolis, Ind.

Fig. 5. An enclosure, which is complete except for the working opening in front of the wheel, is used for finishing steel stock for saw blades.

long strips or tubes must be finished, the under side of the wheel is often used. The conventional hood surrounding the wheel is seldom effective for such cases, as much of the generated dust follows the long surface making it difficult to get air scouring of the part before the dust has passed the zone of effective capture velocity. Use of "dog houses" or "garages," complete enclosures in back of the rotating wheels shown in Fig. 4 and 5, has solved such problems successfully. Considerable material will fall to the floor within the enclosure and access must be provided for removal of such deposits.



Kirsten Pipe Co., and Archer Blow Pipe Co., Seattle, Wash.

Fig. 6. Flexible rubber below the wheel effectively traps coarse particles thrown downward. This design provides no interference for the operator.

RCA, and Brad Snodgrass, Inc., Indianapolis, Ind.

Fig. 7. Trap, usual in buffing hood construction, can be eliminated where polishing operations require the emery coated type of wheel.

Heavier particles torn from the work by the rotating wheel are thrown tangentially with high velocity from the point of release. It is necessary to direct this throw toward the hood or to stop the travel by a shield or deflector if such particles are to be picked up by the exhaust system. Use of a flexible rubber extension to the hood, Fig. 6, represents an ingenious solution to this requirement where a metallic lip or shield would have interfered with the workman. At the same plant, exhaust hooding (see top illustration, page 69) was developed functionally to provide conveniently located racks for small parts being processed.

Exhaust ventilation rates shown in Table 1 have been specified in the recommendations of the American Foundrymen's Society and have been adopted by the American Standards Association. They are in agreement with most state codes covering such operations. Design basis contemplates a minimum indraft through net hood openings of 500 fpm, with larger volumes indicated for buffing and polishing operations prompted by the greater clearance and larger face openings of hoods required for those operations. Where very high peripheral speed buffing is employed, when enclosures like Fig. 4 are employed, or where air cooled buffing wheels are used, it is recommended that volumes shown in Table 1 be increased by 100%. Volume increases of 50% is good practice on grinding, polishing, and buffing applications where trajectory of dust stream cannot be directed into hood or against deflector or shield due to size or shape of part finished.

Branch duct velocities of 4,500 fpm are recommended and will provide the classical 2-inch hood suction. Reduction to 3,500 fpm in the main duct will provide ample conveying velocities and give better distribution among various branches and lower pressure loss for the exhaust system.

A Low-Cost Solar Heated House

MARIA TELKES

Department of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

The solar heated house erected at Dover, Mass., has been occupied since December, 1948, and careful observation made of the operation of its heating system. Many important conclusions were established and these have been incorporated in plans for a new solar heated house which can be built for $10,000. Plans for this house were made by Eleanor Raymond, architect, Boston, Mass.

HEATING a house with the energy of the sun stored in a low-cost chemical, has aroused the interest of the comfort and fuel-bill conscious public, and heating and ventilating engineers. Principles of this method were described in articles published in this magazine, (1) (2) (3)*.

Although the first experimental house of this type cannot be expected to give all the answers to the pertinent technical and economical questions, it is possible to state definite conclusions. These are incorporated in the plans for a new house, shown in Fig. 1 and 2.

The important conclusions can be summarized briefly.

Collection of Solar Energy

Solar energy is collected by a flat-plate collector, using a thin iron plate, painted black to absorb the rays of the sun. To diminish the outward heat losses, two glass panes, with air-spaces between them, are used in front of the metal plate. This combination has an overall heat loss coefficient U = 0.55. The reverse side of the plate forms one surface of an insulated duct, with an overall U-value of 0.15. The combined overall heat loss coefficient is therefore U = 0.7 Btu per (sq ft) (hr) (F), if the collector is free-standing, or if it occupies part of an unheated space, as the attic. If the back loss of the collector could be diminished, the lower *U* value would apply. The collector could therefore form the south wall of the house. This eliminates the need for constructing a south wall and a roof structure to support the collector, and diminishes the costs of construction. However, any heat leakage from the reverse side of the collector heats the house and is of some use. The combined collector is the equivalent of a well insulated wall.

In the winter during the 8 to 10 hours of daylight, the glass side of the collector loses heat at the rate of 200 Btu per (sq ft) (day). If the amount of solar energy is greater than this value, there will be a net gain in heat, otherwise the heat loss will be lowered. Solar statistics show that on bright winter days the amount of solar energy reaching a south-facing vertical wall is around 1,600 to 2,000 Btu per (sq ft) (day). The minimum value of 200 Btu per (sq ft) (day) is observed only during the darkest of the cloudy days.

The experimental house built at Dover, Mass., near Boston, in 1948, has a south-facing collector, built into the roof. The results show that 50 to 60% of the sun's energy could be collected during bright winter days with a net heat gain of 800 to 1,000 Btu per sq ft on such days. The average winter solar heat gain during all days was around 400 Btu per sq ft and nearly 40% of the energy of the sun was captured.

Theoretical calculations appeared to indicate that a tilted collector should gain more heat than a vertical one. The actual experience, however, showed that the

*Numbers in parentheses refer to bibliography at end of article.

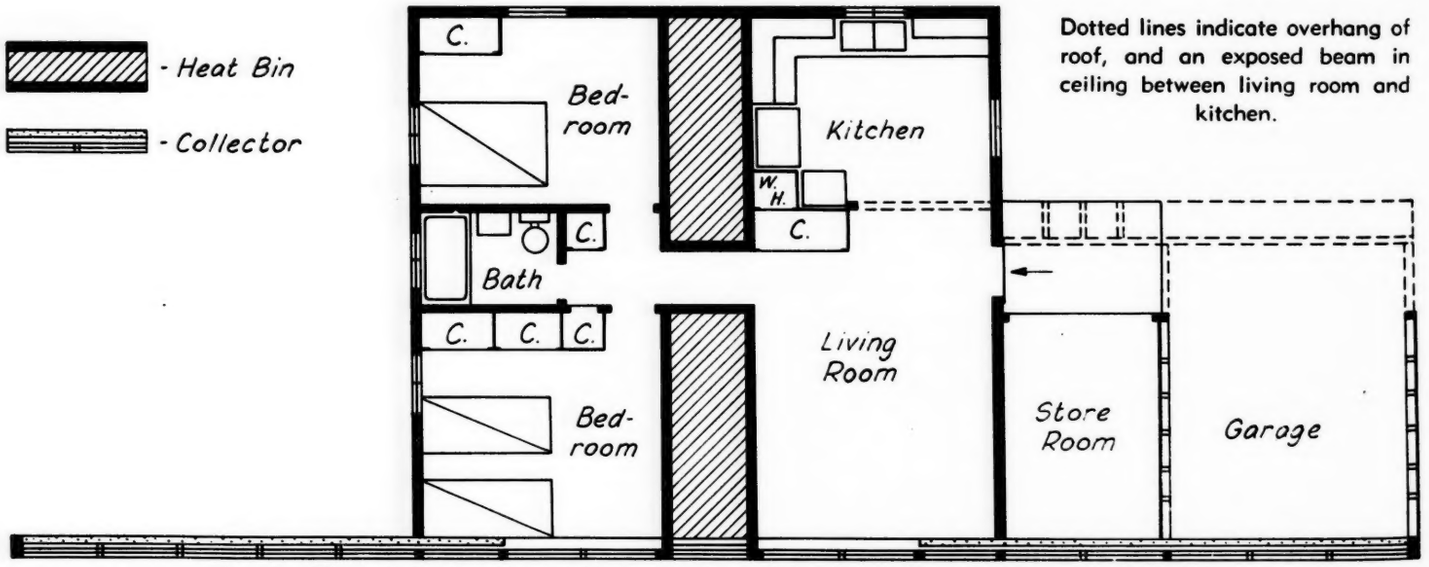
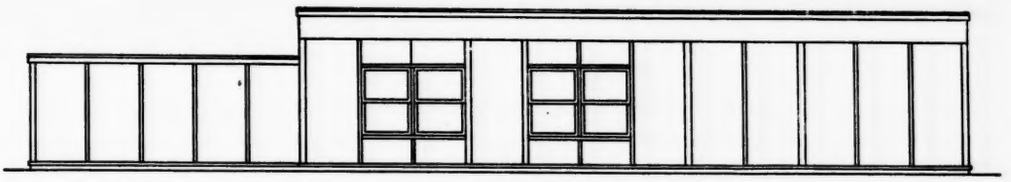
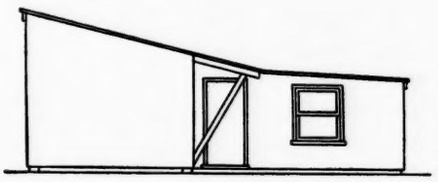


Fig. 1. Plan of the Sun-Heated Minimum House Designed by Eleanor Raymond, Architect.

snow-covered ground reflected additional solar energy during the winter, favoring the vertical position of the collector. The disadvantage of the tilted collector is due to the fact that it gains heat very generously during the late spring, the summer and the early fall, when heating is hardly needed at all. During the summer a tilted collector may become seriously overheated, causing shrinkage of the mounting wood frame. Forced ventilation may be necessary to get rid of the unwanted heat. The vertical collector, on the other hand, receives relatively smaller amounts of solar heat, due to the high altitude of the sun during the summer.



SOUTH ELEVATION



EAST ELEVATION

Fig. 2. South and East Elevations of the Sun-Heated Minimum House.

The shading of the collector cannot be accomplished satisfactorily by using a fixed roof overhang. Much has been written concerning this subject. The fixed roof overhang was regarded as the answer to the problem of keeping the sun away from south-facing windows. It is now clear that adjustable shading devices are required to produce satisfactory results. It should be remembered that the position of the sun is the same on March 21 and on September 21, while April 21 corresponds to August 21. In the vicinity of Boston the amount of solar energy reaching a south-facing vertical wall is compared with the heating requirements in Table 1.

While solar heat is gratefully received by the occupants of the house in March and April, it is most emphatically refused during August and during most of September. The correct shading can be accomplished only by an adjustable device.

Solar Heat Storage

The crucial problem of solar heating is the storage of the collected heat. The experience gained with conventional forms of heating can be followed to good advantage. Solar heat must be stored not only overnight, but for several days of persistent cloudy weather as well. It is difficult to store heat effectively for longer periods. Any attempt to put the solar heat storage unit out of the way, into the attic, or under the ground, is bound to produce an excessive heat leakage loss.

A 5-room house similar to the Dover house, in the vicinity of Boston, may require a solar heat collector of 700 sq ft area, with a heat storage volume of 700 cu ft, which includes the ducts. To minimize the heat loss from the surface of this heat storage unit, the bin might be in the form of a cube measuring 9 ft on edge. The surface of this cube will be nearly 500 sq ft. This storage unit is not larger than the conventional utility room or the space occupied by the furnace and its necessary adjunct, the coal bin or the fuel oil tank.

Let us assume that the heat storage unit is placed outdoors or under ground. It could be insulated to a U value of 0.1. The optimum temperature of the solar heat storage unit is around 90—100F to take advantage of the most favorable conditions of accumulating solar heat during the winter. With average outdoor winter temperatures at 30F, such a storage unit will lose heat at the rate of $0.1 \times 24 \times 500 \times (90 - 30)$ or 72,000 Btu per day. The 700 sq ft collector in the house will show a net heat gain of 280,000 Btu per day. The detached heat storage unit will therefore lose

$$\frac{72{,}000 \times 100}{280{,}000}$$

or at least 25% of the average daily solar heat collection.

It is unavoidable, therefore, that the solar heat storage unit must be within the house. Any heat leakage will be directed into the house. The most satisfactory location for the heat storage is between the rooms, the walls of the heat storing units forming radiant heating panels. This arrangement has been in use in the Dover house and it was found that the radiant heat given off by the heat storage walls was sufficient to heat the house as long as the outdoor temperature was above 40F.

TABLE 1—HEATING REQUIREMENTS AND SOLAR ENERGY

Month	Solar Energy Received on South Wall, Btu per (sq ft) (day)	Heat Load, Degree Days per Month
March	1,200	850
September	1,000	90
April	1,000	540
August	900	—

Large South-Facing Windows

Large air-spaced picture windows are currently favored by architects. From the point of view of solar heating, these south-facing windows are none too satisfactory. During bright winter days the over-sized windows transmit the low slanting rays of the sun in most generous amounts, overheating the house. It is impossible to avoid excess heat on such days, except by reflecting it with aluminum shades or by ventilating the house. The picture windows may have eye appeal, but their heating effect is limited to the hours of sunshine, which in the vicinity of Boston average

4 hours per day during the winter. During most of the remaining 20 hours per day, the system must draw on the stored solar heat.

The overall heat loss coefficient of the large air-spaced picture windows is U = 0.55 presenting a serious heat loss problem at night and on cloudy days. Aluminum painted insulating shades or curtains diminish the heat loss considerably, but they do not compensate for it entirely.

Another disadvantage of the south-facing large windows is due to the fact that they transmit heat during the summer and early fall, when heat is least desired. Even if the windows are shaded, they offer a serious problem in the summer. This fact is well known.

Summer Cooling

The seasonal summer cooling required in Boston averages 400 degree-hours. During the summer nights, the average temperature drops to 65F, or even less, for several hours on most nights. These conditions made it possible to cool the Dover house during the summer. To accomplish this, the heat collector was disconnected from the ducts leading to the storage and was vented to the outdoors. Another short duct connected the storage units to the outdoor air. A thermostatically controlled fan circulated the night air through the storage as soon as the air temperature was below 65F. The cool night air lowered the temperature of the storage unit, which accumulated "coolth" for the coming day. A temperature drop of 4F in the storage was generally sufficient to maintain comfortable daytime temperature within the house. The cooling uses the specific heat capacity of the chemical mixture of the storage unit.

New House Design

These conclusions were used in planning the new sun-heated house illustrated in Fig. 1 and 2. The plan arranges the rooms in a conventional rectangular pattern, which offers the advantage of a lower heat loss when compared to the oblong form of the same volume and the same construction.

The south wall of the house is replaced by the solar heat collector. The walls of the adjacent storage room and car-port (or garage) are additional walls, which are further extended to form part of a patio. The free-standing wall has additional insulation.

The solar heat storage, or heat bin, is located between the rooms; ceiling ducts connect the two parts of the bin. The collector is in direct communication with the heat storage units; automatic insulated louvers separate them during the night and on cloudy days. The rooms, with the exception of the bathroom, receive radiant heating from the walls of the storage units, which should be adequate to heat the rooms when the outdoor temperature is above 40F. During colder weather, thermostatically controlled fans circulate the room air through heat exchanger ducts within the storage units.

The solar heat storage is accomplished with the use of low cost chemicals, which melt at a uniform temperature. (1) (2) (3).

The windows of the new house are more conventional in dimensions.

The construction cost of the new house has been estimated by two contractors in different cities to be in the $10,000 category. This is for the actual building and does not include the cost of the land.

The problem of the sun-heated house cannot be solved by one or two experimental houses, nor can the important features be predicted by calculations alone. The new plan incorporates the most promising features from the technical and the economical point of view. It is hoped that the plans will materialize and that the new house will become another experimental stepping stone toward the use of the sun as a fuel resource.

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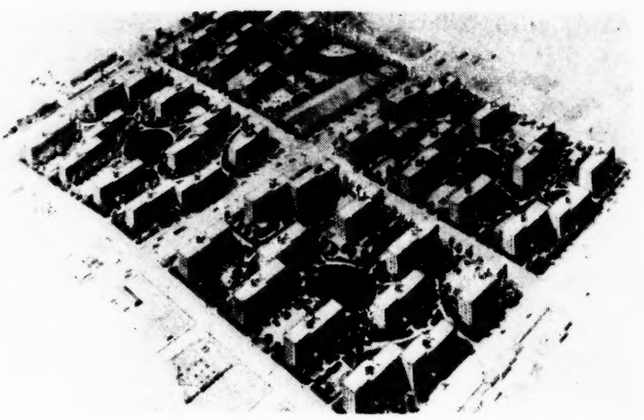
Ravenswood Houses Served by Central Heating System

Nearly 38 miles of steel pipe are being used in the steam heating system for 31 six-story apartment buildings constructed for the $22,000,000 Ravenswood Houses project in Long Island City, N. Y.

It is being built by the New York City Housing Authority to house a population of 7,178. The entire development, including playgrounds and recreational facilities, covers an area of 38.3 acres.

All buildings and each of the 2,166 individual apartments will be heated by a central heating system installed by Caruso-Sturcey Corp., heating contractors. Steel pipe was supplied by Jones & Laughlin Steel Corp. From central boilers, steam will be carried to the various buildings in mains as large as 20 inches in diameter. Smaller risers take the steam to individual rooms, used steam returns through parallel lines.



Aerial view of Ravenswood Houses

Radiant Heating for Schools

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U. S. Steel Corp. Subsidiary

This is the second of a group of articles dealing with the subject of suitable heating systems for school buildings. Each article, by a different engineer-specialist, covers a specific heating system satisfactory for schools.

THE heating system for a school must satisfy the most demanding clients in the world—the parents of school children. These parents want their children to have the benefits of the best available facilities, not only from an educational standpoint, but also from the standpoint of comfort, health, and environment. They may appear critical sometimes of the spending of large sums for a new school or a new addition, but they demand that the lighting, the acoustics, and the heating approach perfection.

From the designer's standpoint the picture presents itself something like this: The conscientious architect or engineer is not only sympathetic with the desires of the parent, but also realizes that he is in a large measure the guardian of the students' health. He knows that poor heating will cause discomfort, and possible loss of valuable time. He knows also that the approach to perfection must be along the road of economy.

Any heating system for a modern school must provide optimum comfort in an optimum manner. Optimum comfort means uniformity of conditions throughout the structure, proper temperature of air and surfaces, and a fresh invigorating atmosphere. Optimum manner of providing comfort, with respect to the student, means that the student will not be conscious of any heating effect and will not be able to sense a change in the thermal conditions. With respect to the operator, optimum manner of providing comfort means the system will require minimum space and maintenance, yet will develop maximum efficiency and output.

System from Students' Viewpoint

First, we shall consider the heating system with respect to the student; and second, with respect to the operators. With respect to the student, comfort is the predominant factor. The comfort provided by the system must be uniform in the sense that the students should have the same thermal sensation regardless of their location or activity. It certainly is not permissible to have such thermal conditions that the students will sense any change as they stand or sit, as they move to or fro, or if the system goes on or off. If the school program changes from study to manual training, to gymnastics or to singing, then immediate environmental conditions should change accordingly so that the student has the same comfort at all times.

To develop this necessary uniformity so that changes of posture, or activity, on the part of the student will not make him conscious of a change in thermal conditions, it is necessary to have two thermal conditions; (1) control of the MRT (mean radiant temperature) and (2) the inside air temperature. The MRT and temperature, for ideal conditions, should be constant for all locations in the room. This is true regardless of the heating system used, but it is more difficult to achieve in some systems than in others. The gradient of the air temperature from floor to breathing level must be kept to a few degrees. If the gradient is large, the students will be conscious of a temperature change as their posture changes from sitting to standing.

If the sum of the MRT and the inside air temperature is constant, the MRT must be constant throughout the room because the inside air temperature can not change appreciably. At the outside wall, however, we are bound to have cold wall areas; therefore, we must have other surfaces warmed to offset the cold wall effect. It can be seen then, that control of surface temperature is essential. By the very definition of uniform comfort conditions, we have defined a radiant heating system.

Uniformity of comfort is probably the most important advantage of radiant heating, but there are other advantages that increase the comfort of the occupant. The environment seems fresher in a radiant heating system because there are no air temperatures greatly in excess of body temperatures. The relative humidity is higher because the air has had no chance to be baked or dried out; in fact, the inside air temperature is maintained several degrees lower than it is for other heating systems. With this lower air temperature and, consequently, higher MRT, the skin and nasal passages are aware of more spring-like conditions.

With a lower air temperature there is a higher relative humidity for a given moisture content in the air. Without adding any moisture, but by merely reducing the inside air temperature, the inside relative humidity can be raised to a more pleasant level. The specific effect of the higher relative humidity has not been quantitatively determined, but all of us are aware of its advantage.

Viewpoint of the School Board

From the viewpoint of the operators or the school board, there are several factors in which all heating systems must qualify. The system should require minimum space, have maximum efficiency, minimum cost, and maximum independence of supervision. It is axiomatic that a radiant heating system occupies less

space than any other heating system. The boiler and utility room are smaller than for the forced warm air system, and of equal size to those of standard hot water systems. Since the heat sources are buried in the floor or ceiling surfaces, no additional floor space need be taken for standing type convectors or radiators. In addition to this saving, the floor space can be more fully occupied because desks or chairs can be placed closer to the walls. With convectors or radiators considerable space must be allowed to prevent students in the row nearest these units from being overheated. Furniture, blackboard or other wall equipment may be placed freely against walls without worry regarding obscuring air outlets or heat sources. There is still another saving in space. Since there are no drafts, desks do not have to be moved because of currents of cool air.

A fuel economy of several per cent may be realized with a radiant heating system because of the reduced inside air temperature. By placing the panels propitiously, the "back loss" can be almost entirely eliminated. For example, the ceiling panel on the first floor would have "back losses" to the floor of the second floor; therefore, the first floor losses would pass on to the second floor as a gain. Similarly the supply and return lines to the panels may be so placed as to have the "losses" from these lines taken up in corridors or other rooms.

There are other factors that may be considered, and of these, automatic control is probably paramount. With automatic control we can reduce both operating personnel and fuel costs and change the thermal conditions in various parts of the structure. With a radiant system, control is somewhat more difficult, yet entirely practicable. With proper application of engineering principles, automatic control can be obtained for any type of school structure. There are numerous articles in the literature and numerous installations to show how control equipment can be designed and applied. With proper consideration, gymnasiums can be maintained cooler, libraries maintained warmer, and all rooms made fresher by controlling the system to maintain the desired thermal conditions.

Costs

The final consideration is that of construction costs. Until recently, radiant heating systems were somewhat more costly to install, but, with an increase in demand, contractors realized there were possibilities for great economy in prefabrication of the coils. At present, based on ½-inch steel pipe, the coils can be purchased —ready to install—for about 20 cents per linear foot of pipe. This price includes the cost of the pipe, cost of fabrication, cost of testing, and the cost of transporting the finished coils to the job.

There we have it, the radiant system as the best provider of uniform comfort—economical to install and more economical to operate and maintain. It is the most modern heating system for modern school building, providing satisfaction for the most demanding clients.

Picture Paragraphs

This electronic torch is so hot it can melt firebrick and even tungsten, which melts at 6098F. No method has yet been devised for measuring the flame's temperature. Developed by Dr. J. D. Cobine (above), scientist of the General Electric Research Laboratory, the flame consists of nitrogen being passed through a high-frequency radio arc. Dr. Cobine is shown melting a quartz rod in the flame. The arc is formed by radio waves at the extremely high frequency of one billion cycles per second, generated by a tube known as a magnetron. The radio waves break up nitrogen's two-atom molecules. When these atoms reunite to form molecules again, heat is released.

The U. S. Atomic Energy Commission set up the above blower installation recently to check the effects of dust concentrations in a small, sealed-in room. The concentrations can be varied by changing the speed of the blower with the Allis-Chalmers Texrope automatic variable-speed drive equipment, shown during adjustment.

Piping Requirements for Automatic Sprinkler Systems

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Piping Requirements for Automatic Sprinkler Systems

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One of the most important devices for preventing the spread of incipient fires in large buildings is the automatic sprinkler. As it came into general use, many rules were established by fire insurance interests, state and municipal authorities to govern the proper design and operation of automatic sprinkler systems. This article presents data of value to engineers concerned with the piping systems for automatic sprinklers.

AN automatic sprinkler system is a piping system supplying water for fire-extinguishing purposes to rows of nozzles called sprinkler heads, sprinklers, or simply heads. They are located at the ceiling throughout the area to be protected and so spaced that every part of this area will receive the water discharged from the heads—ceilings, floors, walls, partitions and contents. The sprinkler heads are equipped with deflectors to spread the water as discharged, and with fusible or equivalent devices which become operative due to the heat generated by the fire below. These devices permit the water to be discharged from the sprinkler heads. A few types are illustrated in Fig. 1, 2, and 3.

Types of Systems

For the most part, automatic sprinkler system piping is normally kept filled with water under pressure from the source of supply up to the sprinkler heads. Such a system is known as a "wet" sprinkler system.

Where the heads and piping supplying them are normally exposed to freezing temperatures that might cause bursting of pipes and fittings to make the system inoperative or to cause water damage, such parts of the system as are thus exposed are normally kept filled with air under pressure. The action of heat upon one or more sprinkler heads releases the air and the resultant lowering of the air pressure opens a valve (located in a heated space) through which water flows into the piping and discharges through the opened head or heads to act upon the fire. This is known as a "dry" system. Sometimes in small non-heated areas, non-freezing solutions containing glycerin or ethylene glycol are introduced into the sections of a wet system so exposed.

Another automatic sprinkler system, sometimes although not generally used to suit special conditions, is a pre-action system, in which the piping to the automatic sprinkler heads is normally filled with air, which may or may not be under pressure. A system of thermostatic devices, actuated by the heat generated by the fire, is installed in the area to be protected and causes a valve to open. This admits water from a gravity tank, or other source of supply, to the sprinkler piping, to be discharged through such of the sprinkler heads that were opened in the usual way by the heat of the fire.

Still another system, termed a "deluge" or "open" system, is sometimes used. In this design the sprinkler heads are always open. Normally, there is neither water nor air under pressure in the piping. A system of thermostatic devices is installed in the area to be protected and the action of the heat of the fire on one or more of these thermostats causes water to be admitted to the system, as described, to be discharged through the open heads. Sometimes the automatic operation is omitted and the water valve is operated manually. In some cases an open sprinkler system is supplied only through a siamese connection on the outside of the building, and water is pumped in by the community fire department's pumper.

Where there is outside hazard from nearby buildings or other sources of conflagration, open sprinkler systems are used as supplementary protection for windows, other openings and flammable cornices thus exposed. The arrangement of heads must be such that each entire window frame and glass will be kept constantly drenched.

The automatic sprinkler system performs several functions practically simultaneously. It detects the fire; automatically proceeds to extinguish it, either wholly or in part; sends out a signal or alarm, not only to those within the building, but also in some cases to the headquarters of the community fire department or a supervisory organization, or both.

The automatic sprinkler system therefore affords these great advantages over other types of fire-fighting systems. However, in the case of an intense fire, a well directed hose and nozzle of a standpipe system will frequently be more effective in extinguishing the fire completely. These two fire-fighting systems complement each other. While recognizing the greater advantages inherent in an automatic sprinkler system, its limitations should also be understood.

Regulations Govern Installation

Because of these advantages, the installation of an automatic sprinkler system is desirable and, in many localities, mandatory under the law for theaters and auditoriums. The heads should be installed above the

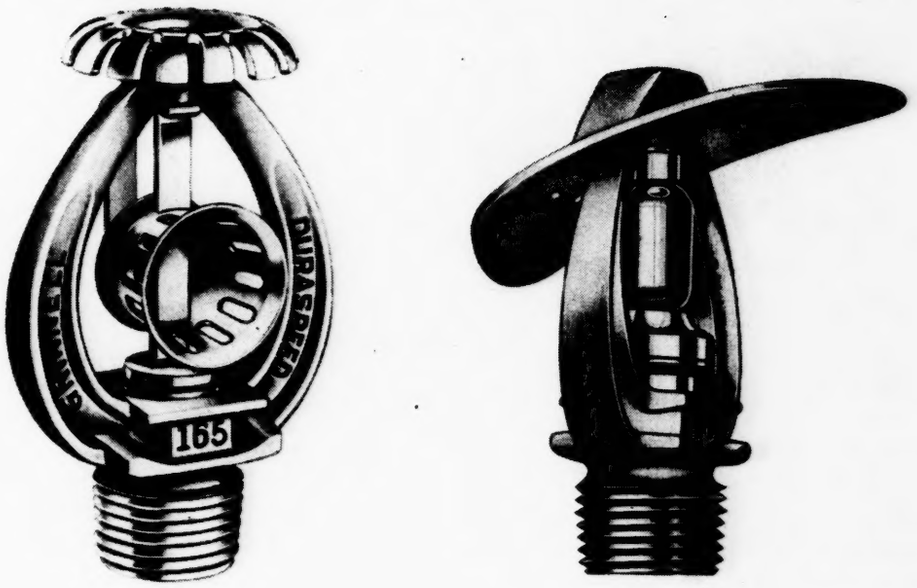

Fig. 1. Duraspeed type of head, left. At right is an automatic quartzoid type of sidewall sprinkler.

All photographs, courtesy Grinnell Co., Inc.

stage and in dressing rooms, storage and workrooms, particularly because fires can easily spread out from the stage, through the proscenium of the theater, into the audience. This is also the case in storage rooms, workshops and laboratories in school and college buildings. And it applies to the public halls and stairways, shafts and other designated spaces in residential buildings of multiple occupancy which are not of the requisite fireproof or fire-resisting construction, and where a hazard of some type or classification exists.

In many states, laws have been adopted relating to the installation of automatic sprinkler systems in factory buildings. For example, in New York State such systems must be installed in all factory buildings over 7 stories or 90 ft in height above the ground, in which wood flooring or wood trim is used, and in which more than 200 people are regularly employed above the 7th story, or above the height stated. They also require sprinklers in industrial buildings or parts of such buildings in which industrial processes involving great fire hazards are conducted, or materials subject to great fire hazard are stored. In New York State, the permissible number of occupants in factory buildings is fixed in relation to the stairway exit facilities provided, but the installation of an approved automatic sprinkler system and a fire alarm system will double the allowed number of occupants without change in the stairway exit facilities. If, in such case, the fire alarm system is not installed, the installation of the automatic sprinkler system alone will permit an increase of but 50% in excess of the base allowable occupancy.

Moreover, the installation of automatic sprinkler systems in buildings, even if not mandatory, is desirable as a protection for life and property. It is accompanied by very much lowered charges for fire insurance on both the building structure and its contents.

In this country, automatic sprinkler systems are, almost without exception, installed in accordance with the methods and arrangements set forth in the standards of the National Board of Fire Underwriters for the Installation of Sprinkler Equipments as recommended by the National Fire Protection Association: the Rules for Installing Sprinkler Equipment prepared by the Inspection Department of the Associated Factory Mutual Fire Insurance Companies; and the codes of governmental authorities having jurisdiction. In New York City the authority to prescribe rules and regulations for sprinkler systems, required under the laws of New York State, is delegated to the municipal authorities. Article 16 of the Administrative Building Code of that city covers both city and state requirements. In these codes will be found detailed information relating to sprinkler systems for all classes of buildings and all types and conditions of construction.

The buildings in which automatic sprinkler systems are installed are in general classified as follows:

(1) Light hazard occupancy, such as multiple or single residential buildings, hotels, hospitals, asylums and other institutional buildings, schools and colleges, libraries, churches, club houses, office buildings and small store buildings.

(2) Ordinary hazard occupancy, such as mercantile buildings used for sales or display purposes, warehouses and manufacturing buildings, both of single and multiple occupancy.

(3) Extra or severe hazard occupancy, as defined by the authorities, which may be applied to the whole building or only to portions thereof.

The following description applies to an automatic

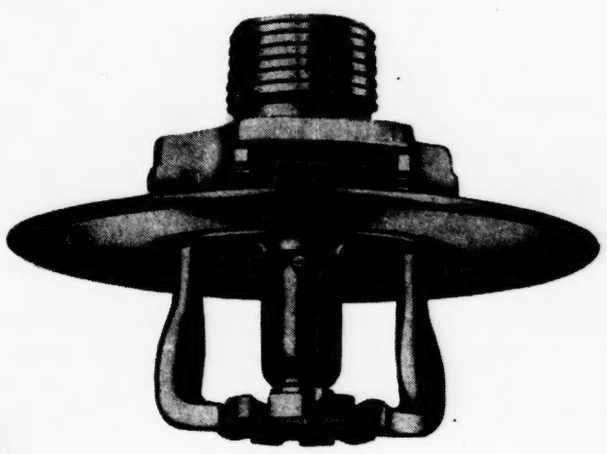

Fig. 2. Automatic quartzoid type of ceiling sprinkler.

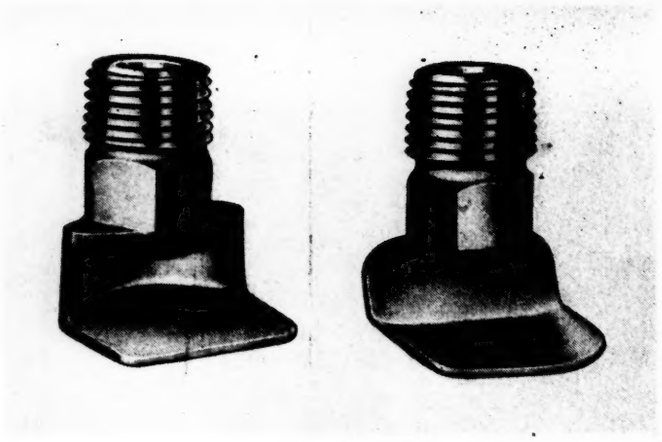

Fig. 3. Two manual release type of heads. Left, is a window sprinkler and, right, a cornice type sprinkler.

sprinkler system installed in a building of ordinary occupancy as defined. Portions of buildings of light hazard occupancy which are protected by sprinkler systems, or those in areas of extra hazard occupancy, differ in general from those in ordinary occupancies with respect to permissible source of supply, number and arrangement of sprinkler heads required, the requirement of special additional protective devices.

Source of Water Supply

An automatic sprinkler system consists of one or more sources of water connected to and automatically supplying one or more vertical pipes (risers) which are located in each fire area of the building to be protected. Mains supplying the risers are called feed mains. From each such riser a distributing main, called a cross main, is taken off in each story of the building. From the cross mains, branch lines (also known as laterals or stringers) supply the rows of sprinkler heads which are connected to tees located at proper intervals in the branch line. An elbow fitting supplies the last head in the row.

If there is more than one riser, whether the system is supplied from tanks above the roof or from a supply below, these risers are connected together into a main in the lowest story, excepting where the system is supplied through an underground yard main. For such a case, a separate valved branch is taken from the underground main to supply each riser.

In order to maintain a supply of water to the sprinkler system before the tank supplies are completely exhausted, branches are run from this main, or from the foot of a single riser, to one or more siamese hose connections installed on the exterior walls of the building, to which the community fire department can connect its pumper. Such siamese hose connections must be independent of those supplying a standpipe system in the building and clearly distinguishable by identifying markings.

It should be noted that each enclosed stairway or stair tower is treated as a separate area and the sprinkler heads located in such stairways are supplied by separately controlled vertical risers, which are connected to the sprinkler main in the lowest story.

An automatic sprinkler system supplied from a single automatic source is termed a "one-source" system. When supplied from two automatic sources, it is designated a "two-source" system. In tall, sprinklered buildings it is quite usual to split the sprinkler system into two or more vertical zones, the lowest zone being supplied from one of the sources, usually a gravity tank, while the upper zones are supplied from both sources. This will be discussed later. A two-source system is mandatory under the law in some cases, but in any case it results in lower insurance rates. The necessity for the second source is governed by factors such as construction, occupancy, exposures and availability of a community fire department.

Sprinkler Heads

An automatic sprinkler head consists of a tapered nozzle, threaded on the outside at the base, so that it can be readily screwed tight into a pipe fitting by means of a suitable wrench. The discharge end is closed by a disc or plug (sometimes called the valve) which is held in place by a mechanism supported in a yoke permanently attached to the outside of the nozzle. Fastened to the top of the yoke is a circular metal concave deflector, generally with slitted edges, set at 90 deg to the nozzle, to receive and disperse the water as it is discharged. The sprinkler head is generally set pointing upwards, but it can be inverted (pendent) when the piping is concealed in a hung ceiling or in the floor fill above. When used in a pendent position, the head must be designed for this service. Sprinkler heads with the deflectors set at an angle, known as the "sidewall" type, are occasionally used for directing a curtain of water down the surface of a wall or partition. Where sprinkler heads are subject to mechanical injury, a guard held in a frame is clamped to the sprinkler head.

The solder type of automatic sprinkler head has been, and still is, most widely used. If the ambient temperature at the sprinkler head rises above a predetermined point, a fusible element in the mechanism which holds the disc or plug in place melts, collapsing or otherwise removing the support. The water or air pressure in the piping forces out the disc or plug and releases the water.

In the more recently developed "bulb" type, a bulb or capsule, made of transparent vitreous material, not subject to corrosion and partially filled with a special liquid, holds the disc or plug in place. When the ambient temperature exceeds a predetermined point, the expansion of the liquid increases the pressure within the bulb causing the bulb to shatter. Pressure in the sprinkler piping blows out the nozzle plug.

Corrosion can, under certain conditions, affect the accuracy of the fusible alloy and thus cause the head to be slow in operating, fail to operate at all, or, on the other hand, open prematurely to cause unnecessary water damage. To minimize this danger from corrosion, the fusible metal is often given a thin protective wax coating by the manufacturer. The bulb type offers the advantage of having the operating mechanism less likely to be affected by corrosion. It is also less unsightly in appearance and is therefore applicable in spaces which are highly decorated and in which the

piping is concealed. Where severely corrosive conditions are encountered, lead or other metallic coating is applied. Care must be exercised so that sprinkler heads are always kept free of paint, both during the construction period and during subsequent repainting.

Operating Temperatures

Under ordinary conditions the temperature of the air which surrounds the sprinkler heads will not exceed 100F. With solder type heads it has been found by experience that a margin of approximately 60F is safe between the maximum ambient temperature encountered and the temperature at which the head will operate. For bulb type heads, a margin of 30F or thereabout has been found to be safe. Hence, ordinary degree heads rated at 160F and 165F for the solder type, and 135F and 150F for the bulb type are required, excepting where special conditions warrant higher ratings.

Where the ambient temperature may be between 100F and 150F, as, for example, beneath a skylight exposed to the direct rays of the sun, intermediate degree heads, rated at 212F for solder type and 175F for bulb type, should be used. For ambient temperatures between 150F and 225F, as may occur above boilers or close to steam pipes, hard degree heads rated at 286F for solder type and 250F for bulb type should be used. For ambient temperatures between 225F and 300F, extra-hard degree heads should be used, rated at 360F for solder type and 325F for bulb type. Bulb type heads rated at 400F and 600F are also made for use with ambient temperatures of 300F to 375F, and 375F to 475F, respectively. The temperature rating in each case is stamped on the head, and the frames are painted in different, specified colors so as to identify the rating clearly.

Installation of Heads

Automatic sprinkler heads having ½-inch discharge orifices are generally used and the number, spacing and supply of heads are based upon the use of this size. The number of gallons of water discharged from such a head varies with the pressure at the inlet, from 18 gpm at 10 lb per sq in. to 58 gpm at 100 lb per sq in. Sizes ¼-, ⅜-, 1-, and 1¼-inch are used in special instances.

To secure adequate protection from automatic sprinkler systems, there must be a minimum of obstruction to the dispersal of the water emitted by the sprinkler heads. Hence, the number of heads and the spacing required are governed by girders, beams and joists projecting from the ceiling to impede or to deflect the normal water spread. For the same reason, operation is influenced by the proximity of walls, full height partitions, stairs (whether open, wholly or partially enclosed) galleries, mezzanines, or ventilating ducts. The presence of high shelving, or tiers of storage bins or other structures or equipment of great height, which rest on the floor, is a governing condition. A clearance of not less than 20 inches and preferably 24 inches must be left between the sprinkler heads and the tops of such fixtures or equipment. Otherwise additional heads will be required.

It is not feasible to discuss in detail, in an article of this scope, all the conditions governing spacing of sprinkler heads. Only general consideration can be given. Detailed data are given in the codes and rules cited. The proper authorities must be consulted in cases involving unusual conditions.

Normally, sprinkler heads are set to discharge upwards with the deflectors parallel to ceilings, roofs or the incline of stairs. However, when installed in the peak of a pitched roof, they are set pointing upwards with the deflector horizontal. The distance of the deflectors from ceilings of mill or other smooth construction, from the soffits of girders and beams when located directly below these, or from the bottom of joists in open joist construction, should never be less than 4 inches and never more than 10 inches. This distance should be between 5 and 8 inches, excepting that in buildings of fire-resisting construction, a maximum of 14 inches may sometimes be permitted. Distances are always measured to the finished surface, whether wood, metal, concrete, plaster, or acoustic or other tile.

Spacing of Heads

Some general observations can be made regarding the number and spacing of sprinkler heads. In buildings of ordinary hazard occupancy and of fireproof construction (reinforced concrete floor slabs supported by reinforced concrete or concrete encased steel framework), or mill construction (heavy plank floors supported by heavy timbers), the allotted area per sprinkler must usually not exceed 100 sq ft and the distance between rows of heads must not exceed 12 ft. For bays 6 to 12 ft in width, one row or line of heads is installed along the middle of each bay and hence the maximum distance between heads in a line must not exceed 8 ft in 12 ft bays, 9 ft in 11 ft bays, etc. With light hazard occupancy the allotted area per sprinkler head may be as high as 168 sq ft and the distance between lines as high as 14 ft. In extra hazard occupancies, the allotted area may not exceed 80 sq ft and the distance between lines 10 ft.

The distance between the last sprinkler in a line from a wall or partition must not exceed one-half the allowable distance between sprinklers in the same direction, but, in some cases, if a pocket is formed in the ceiling between the wall and a structural member, an extra head may be required. In any event, a sprinkler head must be located at least 12 inches from any hanger, pipe, timber, or other obstruction which would interfere with the distribution of the water when the head is operating. The installation of additional heads may be required to insure full protection.

Where ceilings are of open-joist construction, in a room or space with light or ordinary hazard occupancy, the allotted area may not exceed 80 sq ft per sprinkler head. Lines are run at right angles to the joists; heads in adjacent lines are staggered so that those in alternate lines are in line with the mid-point between those in the adjacent lines. Distances between heads may not exceed 8 ft at right angles to the joists nor 10 ft parallel to the joists. The end heads on alternate lines must not be more than 2 ft from walls or partitions and not more than 4 ft from walls or partitions on the

intervening lines. Staggering of sprinkler heads is not required if a smooth ceiling of metal, wood lath and plaster, or other approved material is attached to the underside of the joists. If cement or gypsum plaster or metal lath is used, the allotted area per sprinkler may be 100 sq ft and 12 ft is the maximum distance between lines.

Branch Lines

In an ordinary hazard occupancy, the number of sprinkler heads supplied from any branch line or lateral on either side of the cross main should not exceed 8 and it is sometimes limited to 6. The branch lines are held as close to the ceiling as the construction of the ceiling and the required clearances between the same and the deflectors of the sprinkler heads will permit. This is done to maintain as much head-room below the sprinkler piping as possible.

Where the structural members or other conditions create pockets in which sprinkler heads are to be located, it is frequently necessary to install vertical nipples to bring the heads within the allowable distance from the underside of the ceiling. Sometimes in beam and girder construction, where considerations of head-room or appearance are paramount, slots or holes can be provided in the webs of steel girders and beams. The branch lines (and sometimes the cross mains) can be run through these openings, and the pipe kept at a greater height and installed to be less conspicuous. This practice is also followed when it is desired to install a hung ceiling, for decorative reasons, close to the underside of the beams. The sprinkler heads are installed in an inverted position. Such piercing of steel members must be carefully worked out with due regard to the effect upon the strength of the beams. In some cases, branch lines have been run in the fill of the floor above, and nipples to the sprinkler heads brought down through the floor slabs. Sleeves must always be provided around pipes which pass through such beams or slabs.

Where possible, cross mains should be run close to the sides of deep structural members so that they can be enclosed in furring, if desired. Branch lines must be graded towards the cross mains and the latter towards the risers, so that the sprinkler system can be completely drained of water as described later. If conditions require dropping of short sections of branch mains which would prevent such drainage, special provision must be made for draining such short lengths of piping.

Sizes of piping required are governed by the number of heads supplied and are prescribed by the authorities. They increase from 1-inch for one or two heads to 8-inch for more than 250 and less than 400 heads. Risers larger than 6-inch are generally not recommended.

Risers

The number and size of risers are governed by the number of sprinkler heads supplied in a fire area. In a multi-story building, it is the number of heads in the fire area of a floor that governs and not the total number throughout the building on the riser. If there is more than one fire area in a story, a separate riser for each such area will be required, excepting that a very small fire area may be supplied from the riser of a larger area. If the number of heads in a single fire area exceeds the limits stated, or if the use of a single riser would involve long branch lines with more than 8 heads, more than one riser must be provided.

Usually the riser is so located in the area that it is connected to the cross main at approximately the mid-point of the main. The cross main then feeds in both directions to supply branch lines which extend in both directions from the cross main. This is termed a "center central" feed.

Sometimes it is desired not to have the riser in the middle of a floor, for example, in a space where display fixtures occur, or in a decorated space where it would be unsightly. A "side central" feed can then be used, the riser being located at one side of the space (sometimes concealed in a closet or other space accessible from the sprinklered area). In this case the riser is connected to the cross main at its mid-point, but the branch lines extend in one direction only from the cross main. A few short lines may extend in the opposite direction. Such a side central feed system is frequently used in a building where the width is such that no branch will contain more than 8 sprinkler heads.

In some cases, such as department stores, the side central feed has been used with risers and cross mains located along opposite walls, the branch lines extending from both walls toward the middle of the floor. Feeding from one end is permitted only under limitations. Cross mains are sometimes run in the form of a complete loop and, in this event, reduction is allowed in the pipe size required for the number of heads.

Floor Control Valve

Generally, in multi-story buildings, a valve known as a floor control valve is provided in the connection from the riser to the cross main on each floor and placed close to the riser. In the event of a leak, the piping in that area can be isolated and temporarily drained without interfering with the operation of the sprinklers elsewhere. Ladders or steps, clamped to the risers, are provided to permit quick and easy access to the floor valves.

Floor control valves, however, are sometimes omitted in factory buildings having few stories and where the system is fed from an underground yard main and where the entire riser is isolated by closing a post-indicator valve in the branch supplying the riser. In systems containing several risers, the branch from the feed main to each riser is valved close to the main so that one riser can be isolated without affecting the rest of the system.

Gravity Water Tanks

The primary source of water supplied to an automatic sprinkler system is (1) an elevated or gravity tank; (2) a pressure tank; (3) an automatic fire pump; or (4) a direct connection to the water main in the public street. A one-source system can be supplied by any one of these, a two-source system by any two.

The two-source system can also be supplied by two gravity tanks, each of the capacity that would be required for a single primary source, or two pressure tanks each of the capacity required as a single primary source. Furthermore, if two pressure tanks are required to provide the necessary amount of water as a single primary source, four such tanks would constitute a two-source supply. These sources must be used for sprinkler system supply exclusively. Under certain conditions the same gravity tank may be used to supply both the standpipe and automatic sprinkler systems of the same building or group.

A gravity tank used as a source of supply must contain an available quantity of water sufficient to supply 25% of the total number of sprinkler heads in the average protected area for a period of 20 minutes. For standard ½-inch heads, this is usually taken as 20 gpm per head. The capacity of the tank, however, must not be less than 5,000 gal.

For ordinary hazard occupancy, the bottom of the gravity tank must be elevated at least 35 ft above the underside of the roof of the highest structure which it protects, if it is the single primary source of supply. If, however, it is a secondary source, this elevation may be reduced to 20 ft. Sometimes a single steel gravity tank containing a partition dividing it into two compartments, each of the required capacity, is used to provide the two sources.

The pump used to fill the tank must be of not less than 65 gpm capacity. It is usually required to be manually operated in conjunction with a high and low water electric alarm installed in the tank. The tank fill line must not be used for any other service. While it is good practice to connect the sprinkler fill pump and the house pump so that either can be used in an emergency for either service, separate and independent tank fill pipe lines must be provided from the pumps to the tanks of each system. Sometimes the valve in the cross connection is required to be normally sealed shut. On the other hand, some authorities prefer to have the pumps operated alternately so as to keep both in good operating condition.

The provisions for emptying, overflow access, etc., are similar to those previously described for gravity tanks of standpipe systems (H & V, May 1950). If the tanks are located out-of-doors or in unheated spaces, tank heaters must be provided. These must be capable of maintaining the water at a temperature of not less than 40F in the coldest weather, but must not heat the water above 100F under any circumstances. Where the tanks are elevated above the structure or the ground, all piping connections are brought down close

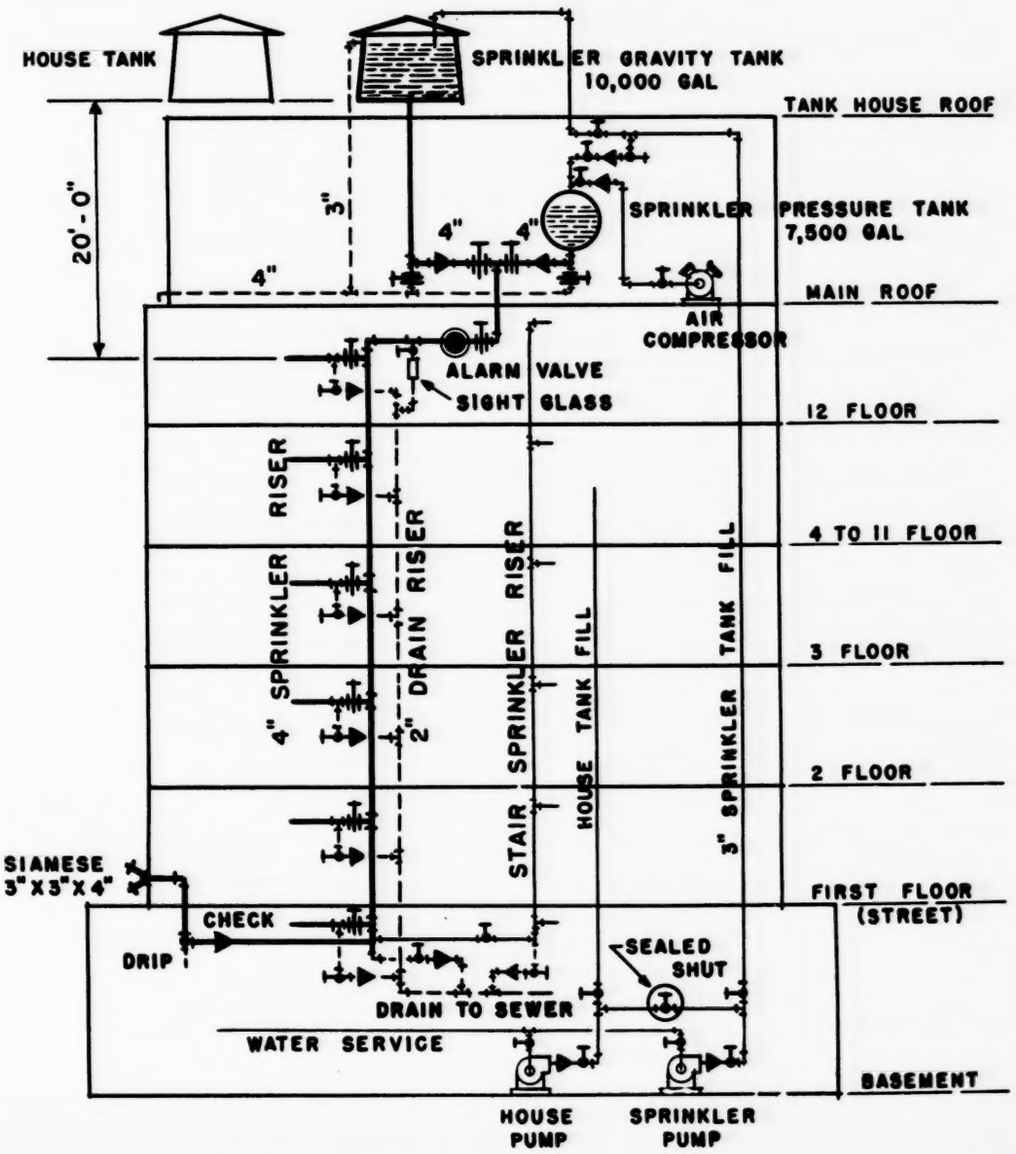

Fig. 4. Wet automatic single riser sprinkler system supplied from roof gravity and pressure tanks.

together insulated, frostproofed, and enclosed in some form of lagging. The steam or hot water connections to the tank heater should be run in the same enclosure as the water pipes. If this enclosure is wood or other flammable material and is exposed to ignition from nearby buildings, it should be coated with cement plaster. Water piping from isolated tanks should be laid in the ground below the frost line. It may be necessary in some cases to install special water heaters in a housing at the base of the tank supports.

Pressure Tanks

A pressure tank used as a source of supply must contain an available quantity of water sufficient to supply 12½% of the total number of sprinkler heads in the average protected area for a period of 20 minutes, at a rate of 20 gpm for standard sprinkler heads. There must be at least 3,000 gal of water in the pressure tank, if an auxiliary supply is provided. The water normally occupies two-thirds of the volume of the tank; the remaining one-third is filled with air under a pressure of 75 lb per sq in.

No single pressure tank may be in excess of 9,000 gal gross capacity. For greater required capacity two or more pressure tanks must be installed. The air compressor or compressors must be of sufficient capacity to deliver at least 16 cfm of free air for tanks up to 7,500 gal gross capacity and 20 cfm for larger tanks. Pressure tanks are usually located above the highest line of sprinklers under the main roof, unless the size or occupancy of a penthouse structure requires elevation above the highest sprinkler lines.

Pressure tanks are filled with water by the same pump which fills the gravity tanks, or, in the absence of the latter, by a pump of at least 65 gpm capacity. In some circumstances pressure tanks are located in the lowest story, but the air pressure maintained in the tank must be increased above 75 lb per sq in. as required by the authorities to insure adequate pressure at the highest sprinkler head.

Spaces in which pressure tanks are located must be heated so that the temperature of the water in the tanks will never be below 40F.

Connections for Risers

In a sprinkler system containing only one riser (not counting stair risers) and supplied by a gravity tank or pressure tank located above the roof of the building, the top of the riser is connected to a valved outlet in the bottom of the tank. A flow alarm check valve is also installed in this connection and is designed so that, when any sprinkler head is opened and water flows from the tank, an electric contact in a normally closed electric circuit is opened, causing both audible and visual signals to be given as hereinafter described. If there are both gravity and pressure tanks, they may be connected into a common discharge header from which the connection is run to the top of the riser, as shown in Fig. 4. If both gravity and pressure tanks are installed, each tank requires a separate shut-off valve in its discharge connection and check valves are also placed to prevent flow of water from pressure tanks into gravity tanks and vice versa. They also prevent the fire department from pumping water into these tanks.

If the sprinkler system contains more than one riser, and is supplied only by roof tanks, whether gravity or pressure, or by both, the risers may be connected together into a common main in the top story, which in turn is connected to the roof tank or tank header. This is shown in Fig. 5. In this event a shut-off valve and a flow-alarm check valve is placed in the branch to each riser. As the several risers are also connected into a common main in the lowest story into which connections are made from the street siamese, a shut-off valve must also be installed in the branch connection to the bottom of each riser. It should be noted that the stair risers are always supplied from the bottom, a valved connection being taken within the shut-off valve controlling the nearest general sprinkler riser.

As an alternate method, under certain conditions, the top connecting main is omitted and an untapped or "dead" riser is carried down from the roof tanks to the lowest story of the building, feeding into the main connecting the bottoms of the risers. In this event a flow-alarm valve is located in the branch connection to the bottom of each riser. The valved branch to the stair riser is taken off between the flow-alarm valve and the riser. In order to prevent an air lock from occurring in a system supplied from both gravity and pressure tanks, via a dead riser, the connection to the latter from the gravity tank must be made at least 40 ft below the bottom of the pressure tank.

Zoning

Under no circumstances should the pressure at any sprinkler head exceed 175 lb per sq in. As a consequence of this, pressure tanks, which must contain air under a pressure of 75 lb per sq in., cannot be used to supply the lowest line of sprinklers when the lowest line is more than approximately 200 ft below the main roof of the building. Gravity tanks cannot be used when the lowest line of sprinklers is more than approximately 375 ft below the main roof.

In order to use pressure tanks only in a building exceeding 200 ft in height, and gravity tanks in buildings exceeding 375 ft in height, it would be necessary to split the sprinkler system into vertical zones and to install tanks at intermediate levels for the lower zones. It is usually desirable to avoid the installation of intermediate tanks, which use up valuable floor space and entail the installation of additional supports and pumps.

In buildings from approximately 200 to 375 ft in height, this can be and is done by providing a sprinkler system split into two vertical zones, as shown in Fig. 6. The pressure and gravity tanks are located above the main roof at the usual heights. If there is only a single riser in the upper zone, or in both upper and lower zones, the pressure tank (or tanks) is connected to the top of the upper system riser. A dead riser is run down from the gravity tank to point of division and there connected to the bottom of the upper zone riser and to the top of the lower zone riser.

A flow-alarm check valve must be provided between the pressure tank and the top of the upper system riser

and another flow-alarm valve in the gravity dead riser at the intermediate floor before it connects to the upper and lower risers. Check valves must be provided to prevent the pressure tank from supplying the lower riser and also to permit the fire department pumper to pump through the lower riser and thence through the upper riser.

If there are several risers in both upper and lower zones, a dead riser is carried down to the point of division from the pressure tank as well as one from the gravity tank. The former connects to a main in the intermediate story to which the bottoms of the upper zone risers are connected. The latter connects to a main in the lowest story of the building to which the bottoms of the lower zone risers are connected, as well as the siamese hose connections. At the intermediate story, a connection is taken from this gravity dead riser into the intermediate story main. In this case a flow-alarm valve is installed in the connection to the bottom of each riser from the respective main. The stair risers are also split vertically and connected in the manner previously described.

Check valves are provided not only to prevent the pressure tank from supplying the lower system, but to permit the fire department pumper to pump up through both lower and upper systems. A split system may have more risers in the lower zone than in the upper if such a condition is required by the shape of the building.

Sometimes it is desired to have sprinklers only in the lower stories of a tall building, but to keep all tanks at the roof level. In such a case gravity tanks are used either as one or two sources. They need not be elevated more than 3 ft above the main roof as sufficient pressure is available in this case without greater elevation.

Street Main Connection

Where conditions are favorable for its use, a direct connection to the street main of the community water supply system constitutes a desirable primary supply for an automatic sprinkler system. It can be used when it has been demonstrated to the satisfaction of all authorities concerned that at all times of the day, and under other specified conditions on all days, a pressure of 15 lb per sq in. can be maintained at the highest sprinkler head. This of course limits its use to fairly low buildings.

In New York City, for example, where a pressure of 5 lb per sq in. only can be obtained at the highest sprinkler head, the city code permits an automatically operated booster pump of prescribed size to be used. However, this arrangement is limited to buildings not exceeding 80 ft in height and having no more than 100 sprinkler heads in the largest fire area. The size of the connection to the street or highway main is required to be at least that of the main sprinkler riser and generally not less than 4 inches. If metering of this street connection is required, a special compound

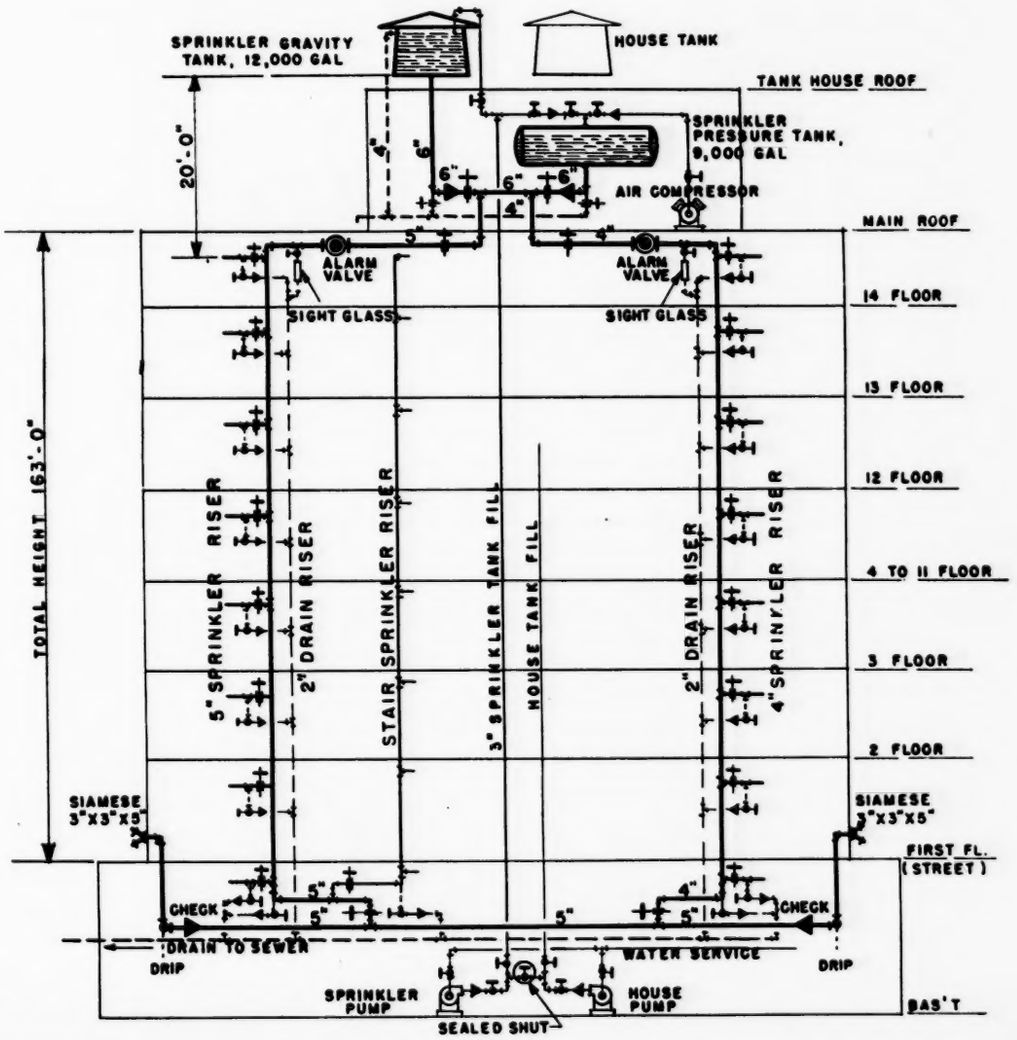

Fig. 5. Wet automatic multi-riser sprinkler system supplied from roof gravity and pressure tanks.

type meter is used. Pressure regulating devices in such connections are not permitted.

Yard Hydrant Systems

Where there is an approved private yard hydrant system with an underground main, supplied by an elevated gravity tank or tanks, street mains, or suitable pumps, connections may be taken from this main underground and into the building or buildings and connected to the bottoms of the sprinkler risers. Where a separate branch is run to each riser, a post-indicator valve must be provided at a safe distance from the building. In such cases the floor control valves are usually omitted.

It is quite usual in the case of yard hydrant systems to provide a fire pump or pumps. Such pumps must draw water from an independently supplied suction tank of suitable capacity, a lake or other reservoir, or from a street main which should be capable of supplying the pump for at least 2 hours at its rated capacity. Such pumps can be driven by steam, internal-combustion engines, or by electric motors if there is a source of electricity not subject to interruption. If automatically controlled, such fire pumps are considered a primary or secondary source of supply. If manually controlled, they are frequently rated only as an auxiliary source of supply.

A fire pump for an ordinary hazard occupancy in a well protected urban district should be capable of supplying 25% of the sprinkler heads in the average fire area for 20 minutes at a rate of 20 gpm per head and of at least 500 gpm capacity. If it supplies yard hydrants as well, the minimum capacity should be 750 gpm. These fire pump capacities are usually increased for outlying districts not having adequate fire department protection.

Outside Hose Connections

The number and the location of the siamese hose connections on the exterior of the building are determined by considerations similar to those for standpipe systems. Where both systems are installed, separate siamese hose connections must be provided for each system and the service clearly designated.

Where there is a single sprinkler riser, the piping into the building from the siamese is connected to the bottom of the riser. If there are several siamese hose connections and only a single riser, the piping connections from the former are joined together in a common main inside of the building which is connected to the bottom of the riser. If there is more than one riser the piping from the siamese is connected into the main which connects the bottoms of such risers, but in such a manner that they are outside of the valves controlling such risers. No shut-off valves are permitted in connections to the siamese, but check valves and means for draining are required, so that water supplied to the sprinkler system cannot flow out through the siamese.

In theaters and auditoriums located in buildings in which automatic sprinkler systems are provided, a separate system is installed for these areas, including a separate source of supply, usually a gravity tank, and separate siamese hose connections.

Draining the System

In addition to a method for emptying the storage tanks previously noted, provision must be made for draining the sprinkler piping system in the event that repairs or replacements become necessary. In order to maintain as much of the system in service during such an operation, means are provided for emptying only sections of the system at a time. As mentioned previously, the branch lines and cross mains are graded to drain towards the sprinkler riser.

A drain connection is taken out at a point between the floor control valve and the cross main in each story, and a connection made into a separate drain riser which is carried down from the top sprinklered story next to each sprinkler riser. In this connection is placed a shut-off valve and a check valve, so that by closing the floor control valve and opening the drain valve the cross main and branch lines can be drained without affecting the rest of the system. The check valve serves to prevent backing up from an upper story into a lower one in case several stories are being drained at the same time.

The drain riser is connected at the bottom to discharge into a storm water drainage system or, if there is a common sewage and storm water drain, through a trap into the latter. Where there are several drain risers, they can be connected at the bottom and the common main connected to discharge as described.

Similar arrangements are made for draining dry sprinkler systems before readmitting air. If a system is graded toward an alarm check valve, provision for draining the latter must be provided. In outlying areas, drain lines can be run through the building walls to discharge outside of the building, but the drain control valve must be placed inside.

To test the operation of a wet system, a valved test connection is taken out of each sprinkler riser near the top, of size to permit a flow equivalent to one sprinkler head. A sight-glass is placed in this connection and the discharge connected into the drain riser through a check valve. In dry sprinkler systems, a test pipe is generally installed at the end of the most distant sprinkler line in the top story.

Wet automatic sprinkler systems, like standpipe systems, must be protected both against freezing and against external corrosion. As the water in such systems remains unchanged for longer periods, the danger of internal corrosion is slight and black steel pipe can be used, excepting where the water in a particular locality is of an unusually corrosive nature.

Automatic Sprinkler Alarm System

The installation of an automatic sprinkler alarm system is quite generally required by the fire insurance authorities and is usually mandatory under municipal or other government regulations. Such an alarm system performs two somewhat separate functions, serving (1) to warn the operating personnel of the building or plant when the condition of the source of supply, i.e. the gravity or pressure tanks, requires

starting or stopping of the fill pump or air compressor and (2) to alert such operating personnel or watchmen, whenever a sprinkler head goes into action. In consequence, the community fire-fighting force is notified either directly or indirectly. To serve (1) are the high and low water alarms and water level indicators on gravity tanks and the pressure alarms on pressure tanks, while for (2) are flow-alarm check valves and automatic dry pipe valves in the sprinkler piping.

Alarms were originally, and in some cases still are, of mechanically operated types. Mercury or other type tank level devices, with indicators located in the pump

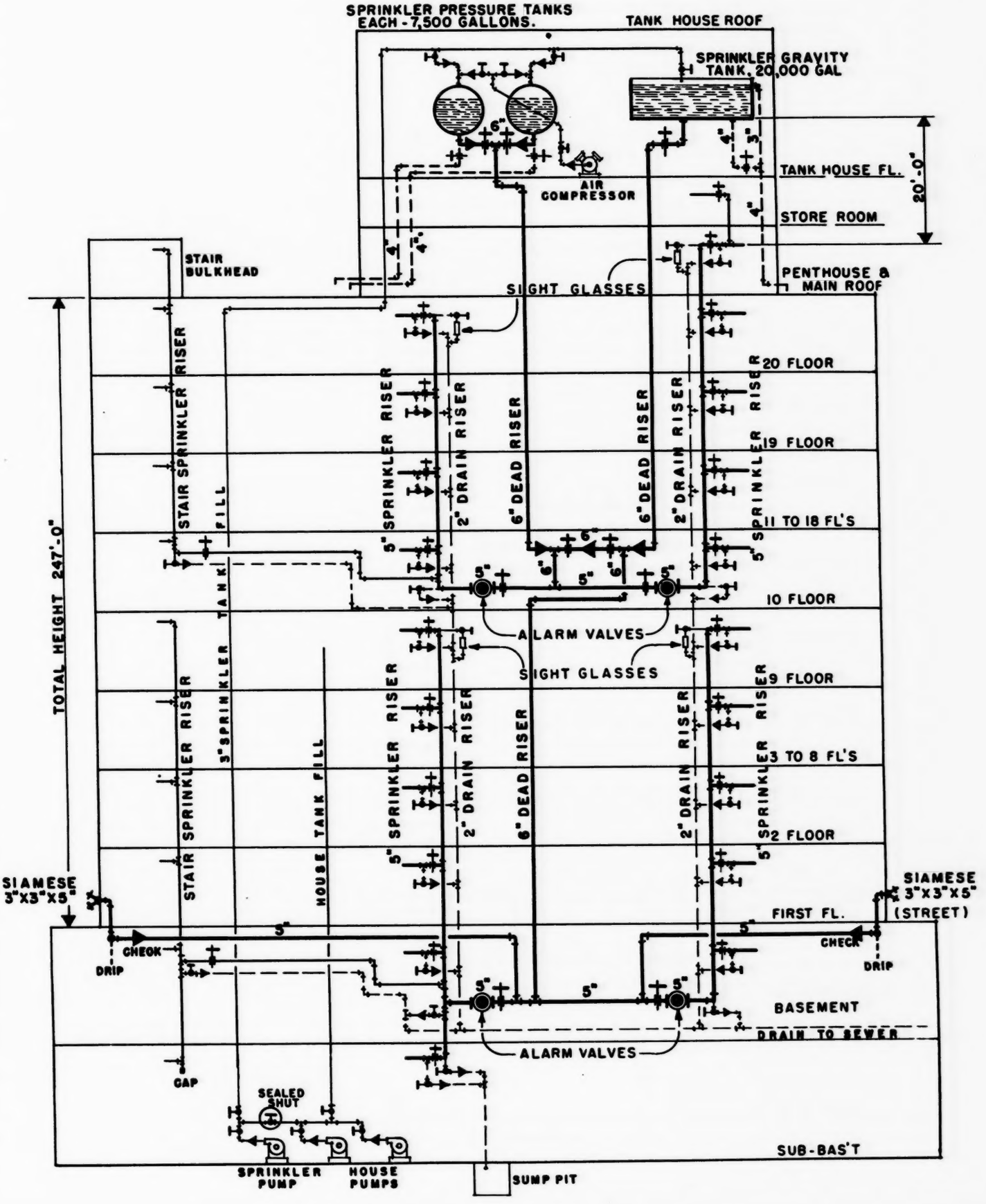

Fig. 6. Details of a split wet automatic sprinkler system.

room or some other selected locality, perform the first function. The second function is handled by gongs, usually on the outside of the building. These are actuated by water motors operated by the water flow through the flow-alarm check valve or dry pipe valve.

Today, electrically operated alarm systems are generally used. If there is a reliable source of electric current not subject to interruption, an electric alarm system offers definite advantages and is mandatory, especially in urban areas.

A closed-circuit system is used. A small electric current normally flows in a circuit or circuits in which contacts are connected operated by floats in tanks, pressure devices, flow-alarm check valves and dry pipe valves. A drop or rise in designated water levels in the gravity tanks, a drop or excessive rise in air pressure in the pressure tanks, the flow of water through an alarm valve, or a drop in air pressure in the dry pipe system, causes such a contact to open, thus breaking the circuit and producing an audible, or visual, signal—generally both.

Audible signal devices may be bells, gongs, horns, or sirens. Visual signals may be annunciator drops, or lamps, or both. The audible signal can be sounded at a suitable point in the building or, if desired, at several points simultaneously. Usually the circuits are all run from the separate contacts to a control board at which the visual signals are located. The audible signals can be located elsewhere. One advantage of a closed-circuit electric system is that an accidental break in the wiring, or a contact which is out of order at any point in the system, will cause the circuit to be opened and to ring a "trouble" bell near the control board. Thus immediate notice is given to the operating staff that the system is not in working order.

The electric alarm system also permits supervision of the whole sprinkler system by an outside agency in case the building or plant operating staff is absent or fails to act. In large cities there are supervisory companies which, among other things, watches over sprinkler systems. Special electric contacts are provided at the control board and other points which permit the signals to be transmitted over special telegraph or telephone wires to the central office of a supervisory company where the signals are both heard and recorded on a tape or chart. Upon receipt of such signals, men are sent to the site at once to investigate and, if necessary, notify the fire department.

If desired, by means of special transmitters connected in the latter system, flow of water through an alarm check valve or dry pipe valve can also cause an alarm to be sounded on the gongs of the manual fire alarm system of the building. This is sometimes done where sprinklers are provided only in a few unfrequented spaces in the building.

For pre-action and deluge systems, the alarms are operated by thermostatic devices in the protected areas, independently of the flow of water in the system.

Water must not be used to extinguish fires when certain chemicals are present, such as calcium carbide, sodium, potassium or magnesium. In these circumstances, water coming in contact with these substances will produce combustion, adding to the fire instead of destroying it. The experiences with incendiary bombs containing magnesium in World War II will be recalled. Water poured on burning oil is likely to float the fire instead of extinguishing it. Water, being a conductor, when poured on fires in or close to electrical equipment may cause short circuits and also subject the fire-fighters to electrical shock.

In such cases built-in or fixed piping systems, with nozzles spaced at certain intervals or directly above equipment to be protected, can be installed using either carbon dioxide or a mixture of special foam-producing solutions. One of the latter contains a solution of bicarbonate of soda and licorice extract or other foam stabilizing agent, which, when mixed with a solution of aluminum sulfate or alum, produces a heavy foam containing tough skinned bubbles of carbon dioxide. In the case of a carbon dioxide extinguishing system, an atmosphere is created which will not support combustion. Foam, on the other hand, clings to the burning material and renders it non-combustible. It is applicable to open vessels containing flammable liquids and greases where the foam envelope will not be objectionable. It is not recommended for use on electrical equipment.

These systems are usually confined to specific areas somewhat limited in extent but requiring such protection. They are not installed throughout buildings of light or ordinary hazard occupancy. Fixed foam systems can be installed out-of-doors to protect groups of tanks containing flammable materials.

In carbon dioxide systems, the carbon dioxide in liquid form under very high pressure is stored in banks of cylinders at a point either within or outside of the protected area and piping run to the nozzles. The carbon dioxide is admitted to the special piping system by means of a valve which may be manually controlled, remotely controlled, or automatically controlled by a system of thermostatic devices installed in the area to be protected. In the last case, manual control (usually remote) is also provided.

Foam systems are (1) the wet storage type in which two solutions are stored in permanently set storage tanks and thence pumped to the discharge nozzles or sprinklers, or (2) the dry type in which dry powder is stored in containers, fed to generators, and then pumped to the piping system. Such systems may be manually controlled. Automatic sprinkler heads, specially designed for such a system, or a system of thermostatic devices may be installed in the protected area to start the pumps automatically. Gravity and pressure tanks are sometimes used. Suitable alarm systems are required. Hose outlets and hose are frequently provided in connection with such systems.

In two-solution systems, a double piping system to mixing chambers and discharge openings is provided so that the foam will be produced as closely as possible to the point of application to the fire. Single piping systems are also sometimes used. Normally, the piping systems are empty and the solutions fed in only in the event of fire.

In order to extinguish quickly and effectively grease fires in the exhaust ducts from the hoods over kitchen ranges in restaurant and hotel kitchens, sprinkler heads are installed inside the ducts and supplied with steam which serves to smother the fire.

How NOT to Acquire a Reference Library

T. W. REYNOLDS
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New York, N. Y.

MY spare time recently has been spent in the attic trying to eliminate obsolete and other items in which I am no longer interested from a 40-year accumulation of magazine clippings (some 6,000) of a technical nature, items I once thought indispensable. One item I came across was entitled "How To Acquire a Reference Library" and, as the rain kept up its steady patter on the roof, I thought, "Why not an article on how to get rid of one, once you become a slave to it and have carted it from place to place." It is an old problem of long interest to many engineers who have solved many a tougher problem. They get stuck with a system and can't let go without acknowledging years of wasted effort.

I estimate roughly that it took at least one half year to accumulate, clip and index this now practically worthless file, more than one percent of my working hours throughout the years. The utter futility of it all appalls me, but I suppose it was necessary for the same reason a dog has fleas to keep his mind off the fact he is a dog. Fortunately, or unfortunately, the file was never lost in a fire as was the case with some engineers I know.

There is a lesson to be learned in the foregoing. How I once filed and how it should be done are quite different things. In earlier days there were fewer textbooks and technical magazines, and they were far less voluminous in their contents and, being few, were more often read. But the most outstanding point is that data formerly was worth keeping for 20 years or more. Later, I concluded that material was useless if 10 years old, until now I would hazard the remark that today one should not save data over 5 years old, if that long. Too, the frequency with which I have need to use my file is growing ever less.

One thing I have learned over the years is not to destroy magazines by fighting to remove the binding staples. At one time, once a year I would tear out desired items from accumulated magazines, because only one operation need be done at a time, and the items could then be sorted easily by subjects to bring like things together for binding. This involved the exasperating task of wrestling with the rusty staples.

My recommendation today is not to tear out anything, but rather to keep the magazines intact. A two or five years' file of magazines takes up less room than clippings gathered over much longer periods. This saves indexing (for the magazines are already well indexed), avoids the need of a filing cabinet, and makes the final discard easy. Simply remove the back numbers after a few years, possibly checking for a few choice items on subjects which change but little with time.

This method also prevents loss of some parts of an article which is continued at intervals from page to page, although today fewer magazines continue a subject on back pages which you unfortunately overlook. This method also keeps intact the advertisements and other items, all of much more value than they once were.

Filing as I did for years, there were many problems as just how to file and where to leave off. For quicker access to what is wanted, the alphabet must be repeated for each of several generalized headings such as Heating, Ventilation; Heating, Ventilating and Air Conditioning. Then all these headings should be repeated and affixed to Installations for articles merely describing installations, for example, Heating Installations.

Heating should be sectionalized for steam, hot water, warm air, radiant, heat pump, and domestic hot water supply. Of course, there must be a separate index for power plants, smoke abatement, dust collection, physiological principles, and a general alphabetical index for subjects not pertinent to any of the other headings. When all is done, one finds that an item on all year around air conditioning needs cross indexing under the headings "Heating," "Ventilation," and "Air Conditioning," then one must decide when a boiler plant is really not such, but rather a power plant, and index accordingly. My advice is not to get mixed up with any of these things.

I have been asked why one should save any magazines, for there are libraries at convenient points. Libraries will photostat any item you want for a reasonable fee. This is satisfactory if you don't mind the prior search for the item, filling out the proper slip, and waiting a couple of days. The larger libraries have everything you need, but they have grown so and become so highly specialized that one is misdirected from room to room after first registering in each and filling out slips, only to find at the last stop that the magazine you want is wanted by everyone else for the moment, or is not available pending binding, indexing, or refiling after readers use.

Many times you can't even get through the crowd around a particular file and, if you do, must make out a slip and wait at least 20 minutes for the light or number to show that your data has arrived at the main desk. All of this I have given up; I now rely on the manufacturer's expert to come in and give me the latest information on the subject.

Methods for Supporting Pipe

J. E. YORK
Building Service Engineer, Stone & Webster Engineering Corp.

Part 4 of a group of articles that describes and illustrates the various means for supporting pipe lines. This article covers toggle bolts, expansion bolts and shields, and beam clamps.

IN buildings with wood floors and beams, pipe hangers may be readily secured to the beams or the underflooring with drive screws, wood screws, bolts, etc., but where buildings are of fireproof construction, other means must be provided for fastening the hangers securely to the building structure.

Inserts are commonly provided for concrete structures. They may be galvanized pressed steel, Fig. 63, galvanized after fabrication to provide maximum resistance to corrosion. They have a lateral adjustment of 2 inches in case the insert is placed a little out of line. When installing, they are attached to the form work with four nails, and as they are only 2½ inches high, they can be used in concrete slabs 3 inches thick or over. Insert nuts of the same overall size for rods from ¼ to ¾ inch diameter are inserted into the slot on the underside of the insert, and the rods are screwed into these nuts.

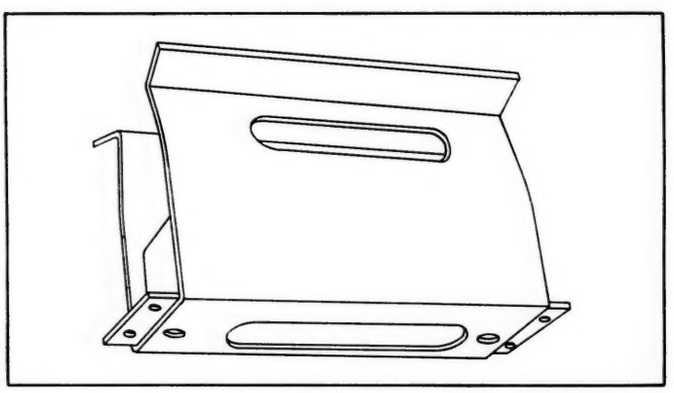


Fig. 63. Galvanized pressed steel insert.

A malleable iron insert with lateral adjustment is shown in Fig. 64. The nut, inserted after the two pieces of heavy plate are assembled, is in place and cannot get out, thus providing a unit in which there are no loose parts to be lost. These inserts are furnished in four sizes, for ⅜ to ¾ inch rods.

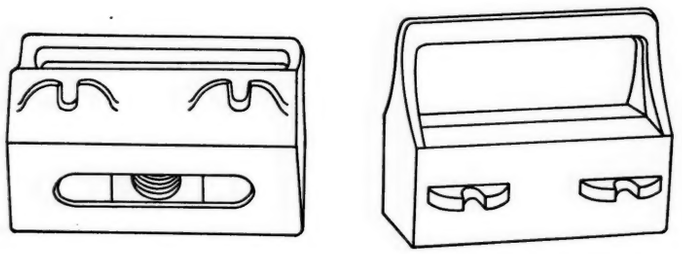


Fig. 64. Two views of a malleable iron insert that permits adjustment.

Two types of concrete inserts without any lateral adjustment are shown in Figs. 65 and 66. Vertical adjustment is provided by means of a long thread.

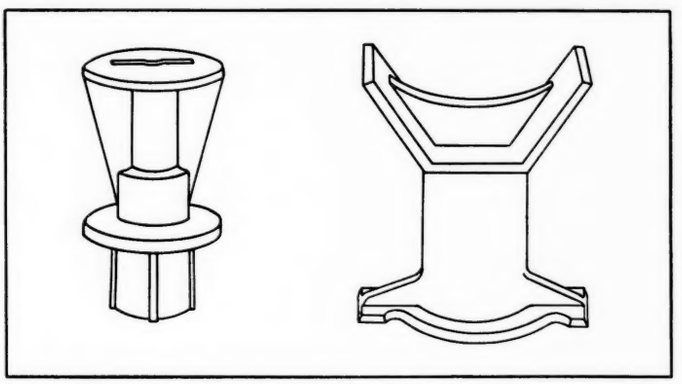


Fig. 65 (left) and Fig. 66 (right). Two types of concrete inserts.

In many cases, the location of the piping to be installed cannot be determined with sufficient accuracy at the time the concrete is poured to permit the installation of inserts. In such cases various types of expansion shields or shells may be used.

The closing back machine bolt expansion shield, Fig. 67, is particularly adapted for use with hook bolts, eye bolts, stud bolts and sprinkler hangers and is used in plumbing, heating and sprinkler work.

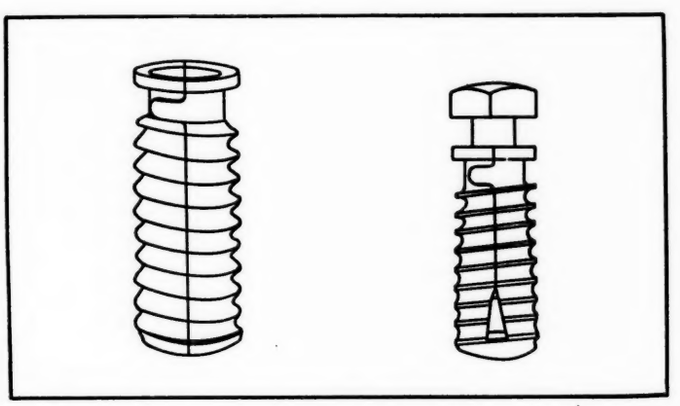


Fig. 67. Machine bolt expansion shield.

A hole of suitable size and depth must first be drilled in the concrete and the shield is then inserted. As the threaded end of the hanger rod is screwed in,

it expands the shield tightly in place against the concrete.

The Loxin expansion shield, Fig. 68, consists of an outer shield clamped together with heavy lugs formed from the sides which prevent the nut from

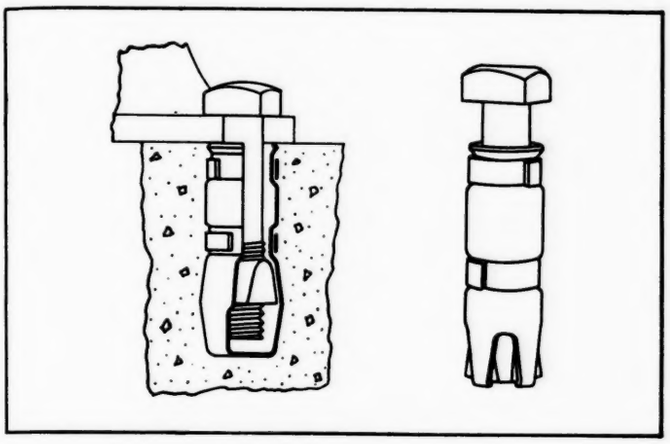


Fig. 68. Loxin expansion shield.

falling out, or the shield from separating. After the proper size hole has been drilled in the concrete, the shield is inserted with the tapered nut at the top. The end of a hanger rod with a long thread, washer and nut is then screwed into the tapered nut, and as the lower nut on the rod is tightened, the tapered nut is pulled down, expanding the sides of the shield and securely locking it in place.

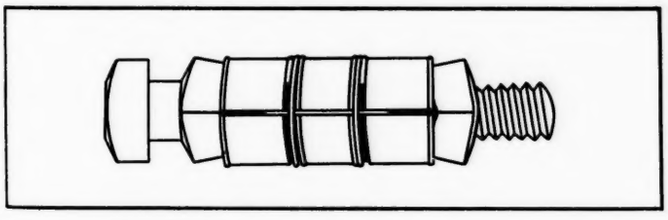


Fig. 69. Star double expansion shield.

The Star double expansion shield, Fig. 69, has two tapered nuts, one at each end with a two-piece shield. The entire unit it held together by two wire springs on the outside.

The Phillips self-drilling expansion shield is shown in Fig. 70. This type of shell forms its own drill. The expander plug is removed and the end of the shell is securely fastened into the drill chuck and the shell is then used as a drill. After drilling to the required depth, the shell is removed and all dust cleaned out of both the hole and the shell. The expander plug is inserted in the end of the shell and the shell is then replaced in the hole and driven home until the chuck again touches the concrete or nearly so. This forces the expander plug into the shell, spreading the sides of the shell end, securely locking it in place. The chucking end of the shell may be broken off flush with the face of the concrete by a quick lateral strain on the chuck, or by striking it on the side with a hammer after the chuck is removed.

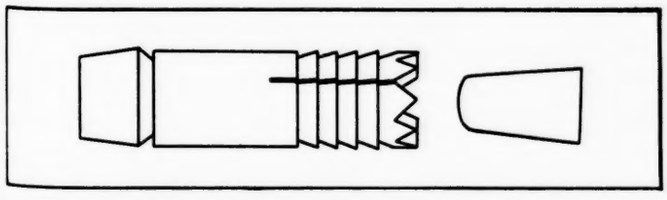


Fig. 70. Phillips self-drilling expansion shield.

To support pipe hangers from hollow tile, terra cotta and concrete blocks, toggle bolts are used. Several types are available, some of which will be described.

The Witch Economie toggle bolt, Fig. 71, is made of malleable iron and steel. The drilling of a $\frac{5}{8}$ inch

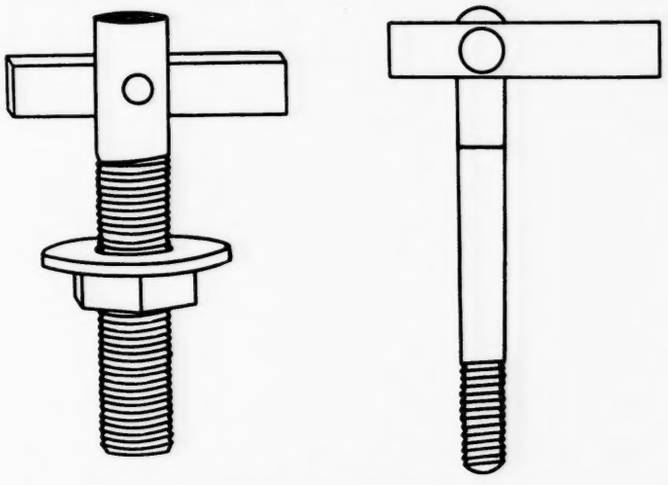


Fig. 71 (left). Witch Economie toggle bolt. Fig. 72 (right). Toggle bolt designed for hollow tile construction.

diameter hole is required to slide the toggle into position. The toggle is threaded for $\frac{1}{4}$ inch standard pipe thread outside and tapped for $\frac{3}{8}$ inch U. S. Standard machine thread inside. The flat round steel washer and $\frac{1}{4}$ inch pipe locknut are furnished. The supporting threaded rod may be lengthened with coupling and $\frac{1}{4}$ inch pipe.

The steel level is placed on edge and when in place the strain is on the main body of the toggle and is not dependent on the rivet.

The toggle bolt, Fig. 72, is designed for use in hollow tile construction. It is made of steel in two

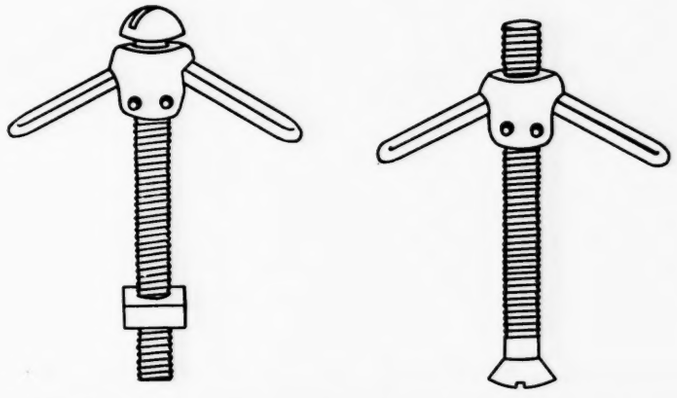


Fig. 73 (left) and Fig. 74 (right). Two forms of the Springin toggle bolt.

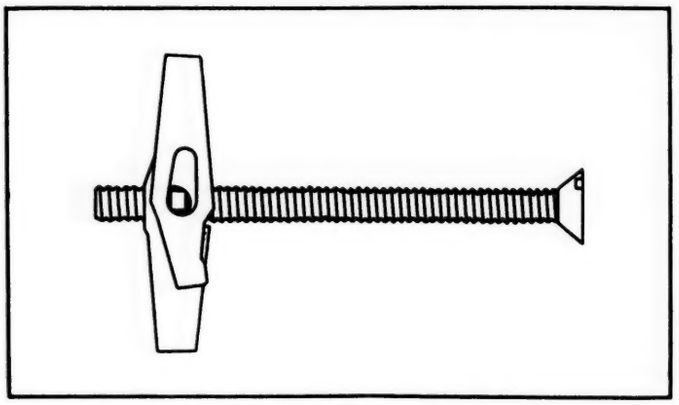


Fig. 75. Spring toggle bolt with trunnion nut.

parts with flat bar cross piece and rod threaded and flattened at the end and then riveted together, so that when placed through the hole in the tile, the cross bar will drop into position. No locknut is provided with this type of toggle bolt.

In Fig. 73 a Springin toggle bolt is shown. The resilient wings of the toggle bolt yield easily when being entered into the hole and automatically spring into place. An outside nut may be provided for tightening, or it may be provided with a flat or round head stove bolt which screws into the head of the toggle to permit the take-up being all on the inside, as shown in Fig. 74.

The spring toggle bolt, Fig. 75, is made with two wings that engage a trunnion nut and are actuated by a spring which spreads the wings after the toggle has entered the hole. An end of the spring is extended to prevent rotation of the toggle as it is tightened.

Beam Clamps

Where piping is to be installed in buildings with exposed steel framing, the hangers may be attached

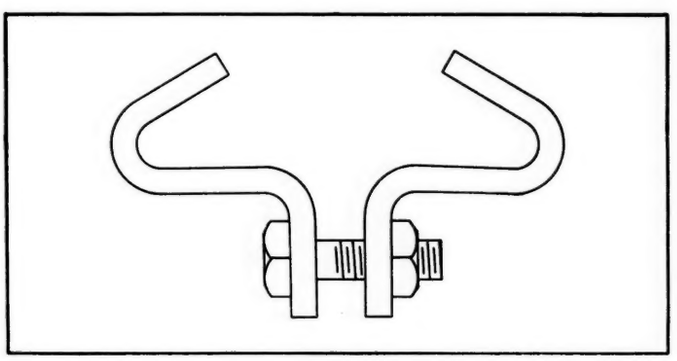


Fig. 76. Beam clamp for attaching hanger.

to the steel with beam clamps of the type shown in Fig. 76. The two halves of the clamp are bolted together with the eye-bolt end of the hanger rod as a spacer between them.

Another form of beam clamp is shown in Fig. 77. This type of clamp provides a means for vertical adjustment by means of two nuts on the upper end of the rod, not illustrated.

The combination clamp hanger, Fig. 78, is used where pipes are to be run with minimum clearance under supporting I-beams and no adjustment is necessary.

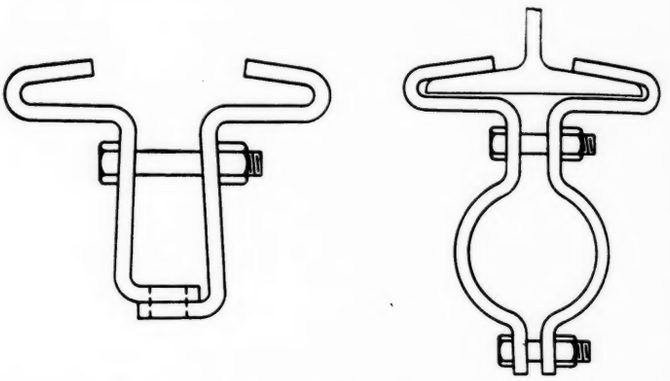


Fig. 77 (left). Beam clamp with vertical adjustment. Fig. 78 (right). Combination beam clamp and hanger.

A clamp for use with channels or angle irons is shown in Fig. 79. The top bolt tightens the clamp to the structure and the lower bolt provides a means of attaching the eye-bolt end of the rod.

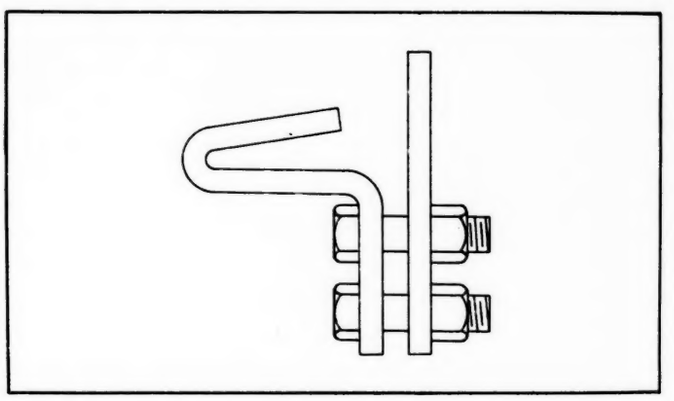


Fig. 79. Clamp for use with channels or angle irons.

A four-part adjustable beam clamp is shown in Fig. 80. The hook parts slide through the center support to the desired position. The bolt is then tightened, which engages the teeth on the inside of the slide bars,

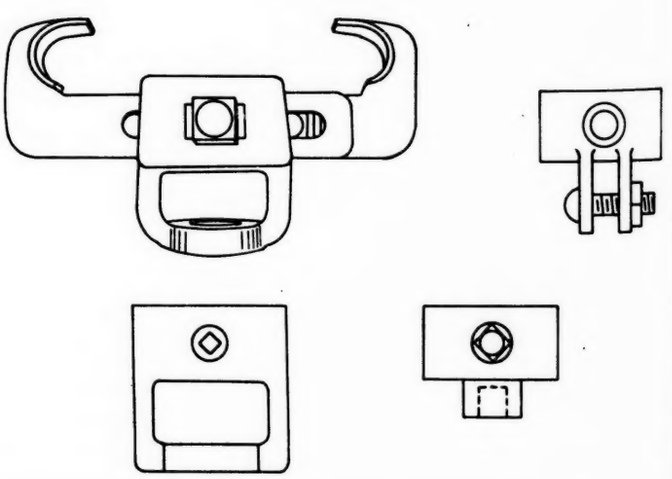


Fig. 80. Four-part adjustable beam clamp. Three other designs for the center support are shown.

thus eliminating the possibility of slipping. A lock washer prevents the nut from turning. This type of clamp is made in two sizes for beam flanges from 3 to 7-inch and from 8 to 12-inch, respectively, and can be obtained with the center support furnished with a clevis for use with an eye-bolt hanger, a yoke with slip hole to take a hanger or pipe rod with two nuts, or with the base of the center support tapped for ⅜ or ½ inch rod.

The adjustable beam clamp shown in Fig. 81 is less expensive than the one shown in Fig. 80. It is made

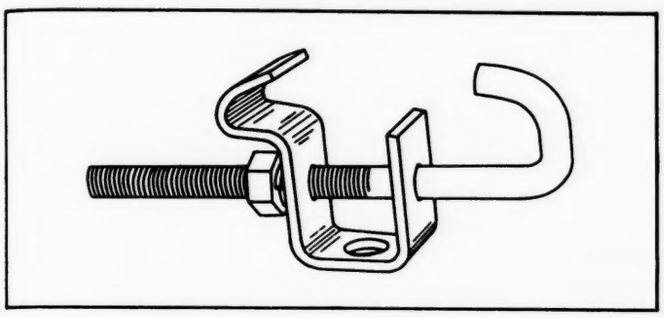


Fig. 81. Steel adjustable beam clamp.

of steel with a threaded rod for adjustment and is locked in position with a hexagon nut and lock washer.

The adjustable beam clamp, Fig. 82, is composed of two malleable jaws and one right and left steel collar bolt. Adjustment is obtained by turning the bolt, thus

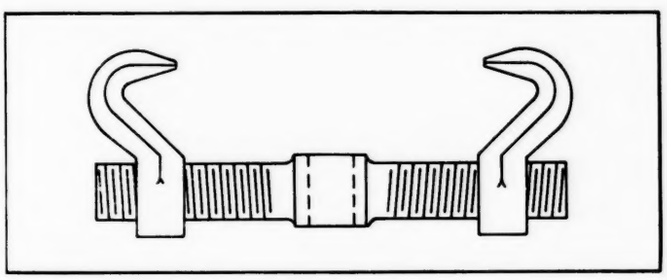


Fig. 82. Adjustable beam clamp with movable jaws.

pulling up the jaws to the desired grip. The adjustment is simple and positive in its action, but is slower in operation than for other adjustable beam clamps described previously.

The beam clamp shown in Fig. 83 is made of forged steel throughout and is furnished in three sizes only,

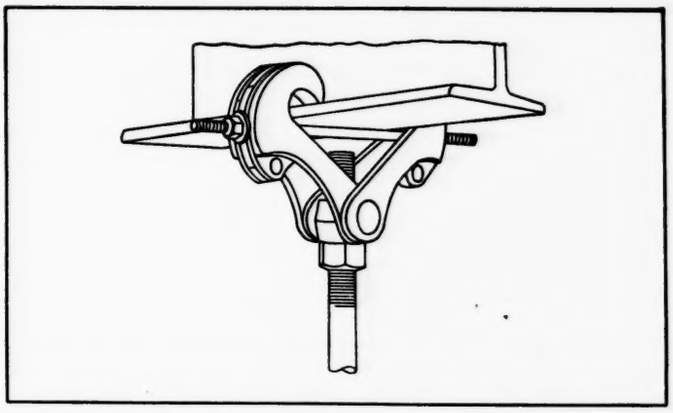


Fig. 83. Beam clamp with supporting rod hung from clamp pivot.

for supporting pipes up to and including 24 inches. These three sizes permit the use of these hangers on beams with flange widths up to 10½ inches.

They can be easily applied to the beam flanges and quickly locked securely in place by means of the nuts on the horizontal adjusting rod, and vertical adjustment can be made by means of the nuts on the hanger rod.

The I-beam C-clamp, Fig. 84, is sometimes used for attaching a pipe hanger to the flange of a steel beam or channel, but unless the beam is tilted, or a retaining strap is provided to prevent the clamp slipping off the beam, its use is not approved by the Underwriters for sprinkler systems and it should not be used on other piping systems.

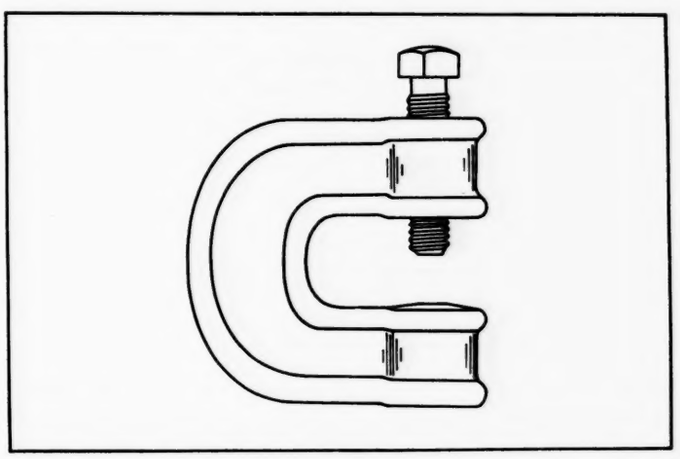


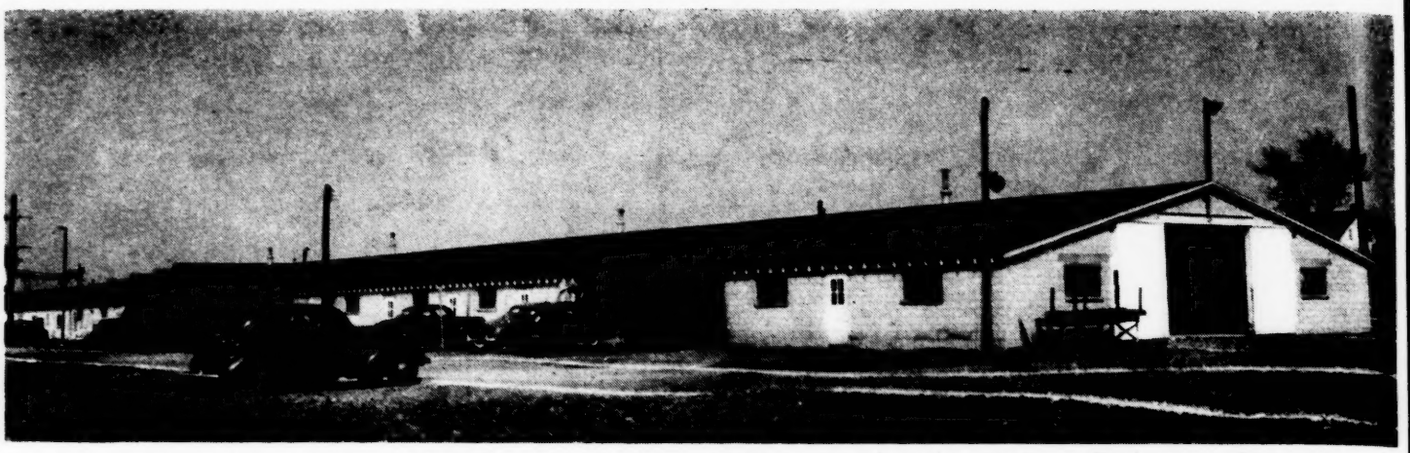
Fig. 84. C-clamp for hanging pipe from an I-beam.

North Carolina State College Builds Skating Rink

Ten miles of wrought iron pipe were used in the ice skating rink recently completed for the North Carolina State College at Raleigh.

The pipe is laid in the shape of huge hairpins, with the fittings, such as valves and vents, located at one side of the rink, and all return bends at the other. The hairpins of wrought iron pipe were laid on supports, so that the concrete floor, when it was poured, completely embedded the coils of the brine circulating system.

The building was designed by Northrup & O'Brien, Architects, Winston-Salem, N. C.; the rink was designed by Bevington-Williams, Inc., Indianapolis, Ind.; Frank B. Turner, chief engineer for the State of North Carolina, was in charge of the project at the North Carolina State College.



Part of the extensive combined farmers' market, general store and cattle auction at Quakertown, Pa.

Heating an Unusual Farmers' Market

NORMAN ROTENBERGER
Heating Contractor, Quakertown, Pa.

FOR 24 hours each week an outstanding example of mass merchandising, that is a development of the outdoor markets founded in many communities, takes place in Quakertown, Pa. It combines a farmers' market, general store and cattle auction, and functions for only 6 hours daily on Wednesdays and Fridays, 12 hours on Saturday. The irregular occupancy resulted in an unusual heating problem.

The market consists of a main building, 1,200 ft long, and about 1,300 ft of outside sheds, with space for parking 20,000 automobiles. These sheds and buildings, located on a tract of 140 acres, are owned by the Quakertown Sales Co. which rents out areas for the sale of everything from hot dogs to prize bulls. About 40,000 persons come to these Saturday markets each week to buy and to enjoy the country fair and Coney Island atmosphere that prevails.

In warm weather the outside sheds are used but during the winter months the market moves indoors.

A conventional radiator heating system was ruled out for the main building because of the short periods during which the structure is used. The large areas to be heated presented a definite cost problem, for a conventional system of heat distribution would cost more than the owners were willing to spend.

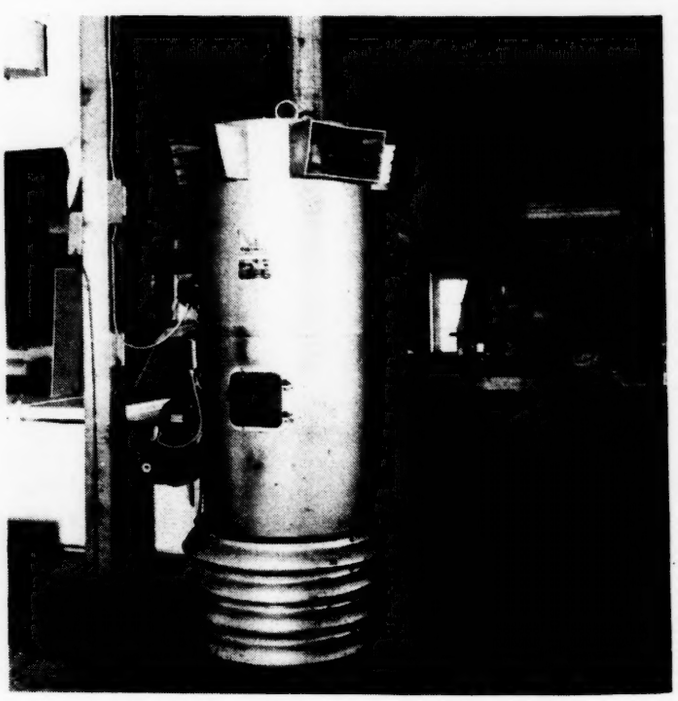
A direct-fired heater of large capacity was recommended for consideration. However, since a large unit would require an extensive system of ducts, that too was ruled out because of cost. Also, fear was expressed that the noise would prove disconcerting.

It was felt sure that the solution was direct-fired heaters larger than the large ceiling-hung jobs but smaller than the type used for a central heating plant.

A study was made of the Prat-Daniel Thermobloc floor model direct-fired heater with a capacity of 300,000 Btu per hr. This unit stands 7 ft high and has a silent-operating fan.

To determine that this unit was the answer to this special heating problem, and at a cost which the owner did not consider excessive, one section of the main building, where the heat loss was about 1,200,000 Btu per hr, was selected. Four units were placed at strategic locations in this area. It was found that because of the 7 ft height of this heater the warm air was directed over the heads of those in the building, and the fans resulted in quiet operation. With these direct-fired heaters, no ducts were necessary.

Like many other heating contractors, our firm has found direct-fired, self-contained units of the larger sizes to be increasingly useful in plant heating. However, this is the first time the conditions were found to be right to warrant their use as described.



One of the floor units that was installed.

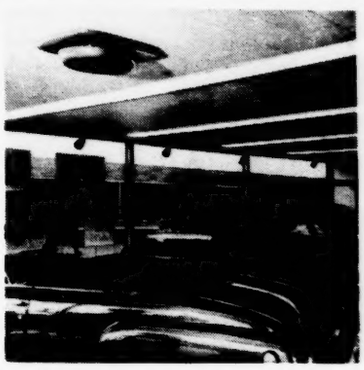
PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Vertical Unit Heaters Recessed in Ceiling

PROBLEM: In an automobile showroom, vertical unit heaters were specified, but head room was insufficient to allow proper throw.

SOLUTION: Two Modine vertical unit heaters were attractively recessed in the ceiling and fitted with Cone-Jet deflectors permitting manual adjustment of air distribution pattern. Inlet to the heater was from a plenum formed by the ceiling and the roof. Ceiling grilles located above display windows permit verticals to draw room air into the plenum for reheating and recirculation. Plenum conceals all piping and wiring and provides space for workmen to service the installation.



RESULT: Heating of the entire establishment, consisting of display room, service and repair departments, was simplified by use of unit heaters throughout. Attractive appearance of display room ceiling was maintained.

Heating Cable Helps Move Oil

PROBLEM: An oil storage tank of a machine tool manufacturer was located above ground in such a manner that No. 6 fuel oil is gravity fed to boiler system burners through two 40-ft lengths of 2-inch pipe. Since 20 ft of each pipe line is above ground, some means had to be found to prevent the heavy oil from congealing in lines during cold weather.

SOLUTION: Two 120 ft lengths of G-E heating cable were used. One length was wound separately around each of the two pipes leading from the 15,000 gallon storage tank for a distance of 20 ft from the top of the tank to one foot underground. Each cable was formed in a hairpin, wrapped around pipe at 6-inch intervals, and covered with asbestos insulation. Automatic thermostatic control was installed to insure proper fuel temperature.

RESULTS: During a severe winter, no difficulty was experienced with the heavy oil congealing in the pipe lines.

Dehumidifier Increases Comfort, Cuts Mold

PROBLEM: Owner of a home near Philadelphia was troubled by mold and musty odor in rugs and furniture during humid summer periods. Cost of complete air conditioning was very high. Owner felt temperature not too unsatisfactory, but was concerned with humidity. Air conditioning installers understandably refused to install system which would not drop temperature on grounds visitors would not share owner's views and would condemn job as inadequate.

SOLUTION: A Frigidaire dehumidifier, a refrigerating unit intended for reducing humidity in damp basements and similar applications, was placed in the living room. With this, the moisture was reduced, although the dry bulb temperature was actually raised. The capacity of the unit in terms of water removal, is from 5¼ to 6½ quarts of water per 24 hours when the relative humidity is 65% and the dry bulb temperature 70F.

RESULTS: From the standpoint of controlling mold and odors, the installation was completely successful. From the standpoint of living room comfort, the degree of success was dependent upon the combination of temperature and humidity prevailing outside. The more severe these were the more noticeable the relief. For example, in the living room, with outside temperature in the nineties and humidity in excess of 90%, it was possible to maintain a relative humidity in the living room of under 70%, with temperatures between 80 and 85F. Under these conditions, with a large circulating fan, a decided sense of relief was obtained as compared with the outside conditions.

For the sleeping quarters, however, on the second floor, where the temperature level is naturally higher, the increased temperature resulting from the operating of the dehumidifier and fan more than offset the effect of reduced humidity, and it was found impossible to operate this unit at night, or for too long a period during the day, without developing excessive room temperatures. It was possible, however, to operate the unit for a sufficient time to control mold and eliminate musty odors.

The limitation on the use of the unit for general air conditioning purposes is due to the temperature rise which results both from the heat of the motors and the release of heat from the condensation of moistures. Under average conditions, the temperature of the outgoing air is about 3 deg F higher than that of the entering air, and over a period of continuous opera-

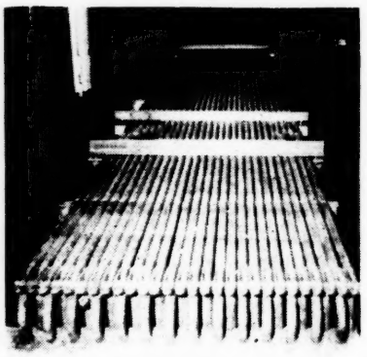
tion of 10 to 12 hours, in a large room, this results in a temperature elevation of from 2 to 4 deg F. This rise in temperature is not important so long as the top temperatures stay at 80F or below, but if the room temperature reaches 82 to 85F, the additional heat becomes oppressive.

Living room, library and hall stairwell, of about 6,500 cubic feet, have been maintained at a relative humidity of between 65 and 70%, with an elevation of 2 to 3 deg F in room temperature, the maximum being under 82F. Under these conditions, with a large circulating fan, the room is most comfortable, all mold and odors from over-stuffed furniture and rugs has been eliminated, and swollen cabinet drawers have become workable. Because of the somewhat higher temperature, the water removal has been at the rate of 5¼ quarts per 24 hours.

It should be emphasized that the unit was designed for dehumidifying and not for general air conditioning, so that the limitations mentioned are not criticisms. As a matter of fact, the performance of this device in solving a problem it was not designed to solve is noteworthy.—N. K. CHANEY

All-Mercury Generating Station Needs Special Tubes

PROBLEM: Unusual conditions of temperature and pressure in a boiler unit at the Schiller Station of the Public Service Company of New Hampshire at Portsmouth resulted from the use of mercury vapor instead of steam in primary phases of the generating cycle. The plant is the first mercury unit power plant in which there is no steam generated directly from the combustion of fuel. The plant was designed and built by General Electric Company, and two Babcock & Wilcox mercury boilers generate the mercury vapor used in the cycle. The mercury vapor passes through a mercury turbine which drives an electric generator. The exhausted mercury vapor passes into a heat exchanger which is water cooled and acts as a condenser-boiler. Due to high temperatures corresponding to the low pressures of the mercury vapor as compared to steam, the heat given up by mercury vapor in the heat exchanger produces steam at approximately 650 lb per sq in. The steam generated by the condensing mercury is superheated in combustion gas outlets of the mercury boilers and serves additional turbo generators. High temperatures and rapid changes in specific volume of mercury require special boiler construction and special materials.



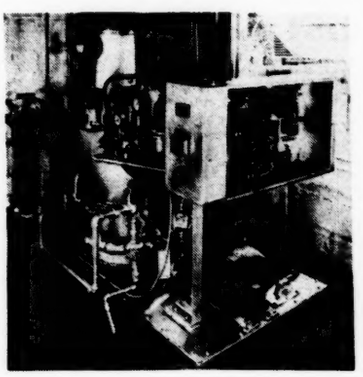
SOLUTION: Tubes exposed to fire are of Croloy 5 Si. Diameter of tubes is successively increased to handle volume changes. Tubes in front and rear walls, for instance, are ⅞ in. I.D. at the bottom and increased in two stages to 1⅛ in. I.D. at the top. Side wall tubes increase similarly from ¾ in. I.D. to ⅞ in. This is accomplished by welding the required size tubes together to form a long tube with varying inside diameter. Tubes are welded to top and bottom headers.

RESULTS: Use of mercury vapor and secondary generation of steam with steam superheated in combustion outlets of mercury boiler results in a plant which is expected to have a net heat rate of 9,200 Btu per kilowatt hour. High fuel costs at Portsmouth are offset by the low heat rate of the cycle and the plant is the most efficient of its size. Installed capacity is 40,000 kilowatts.

Heater Warms Water in Standing Buses

PROBLEM: To prevent water in big passenger bus engines from freezing while stored outdoors overnight in cold weather.

SOLUTION: To replace the practice of starting engines at fixed intervals during the storage period, Vapor Heating Corp. and Tropic Aire, Inc., have developed a method whereby water in the bus cooling system is heated from a source independent of the vehicle. The system is connected to a hot water heater which derives its heat from a steam generator. One heater can keep twenty buses warm in winter weather. Three hose are attached to special fittings on the motor and water from each motor is circulated through the heater.

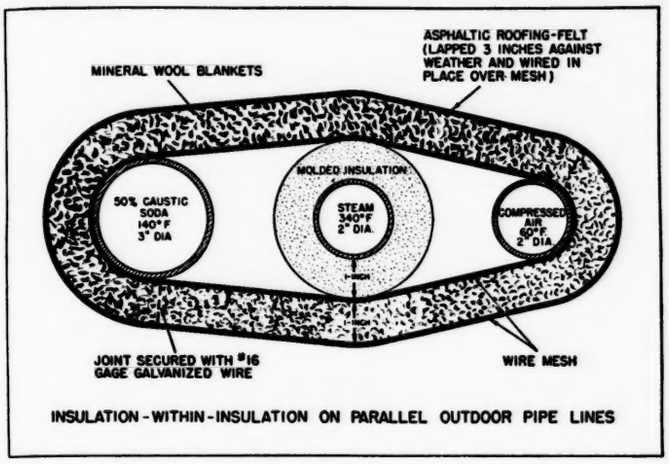


RESULT: Twenty buses can be kept warm by using one or two gallons of fuel oil per hour rather than 5 to 8 gallons of fuel per hour required to run a single bus motor at idling speed.

Insulation Technique Protects Outdoor Lines

PROBLEM: Stauffer Chemical Company, Niagara Falls, N. Y., planned to insulate parallel steam and process lines outside the plant. It was found that the steam line, carrying 340F steam, would overheat the process lines (a caustic soda line and a compressed air line) when the three were insulated as a unit.

SOLUTION: Insulation of the steam line to a thickness which would permit escape of only enough heat to prevent freezing in the process lines was first applied and the three pipes then encased in an overall covering of mineral wool. Insulation technique was as follows: One inch molded sectional pipe insulation was applied over the entire surface of the two inch steam pipe. Mineral wool blankets sandwiched between facings of wire mesh were shaped around three pipe lines. The blankets were wired in place and abutting ends and edges of the blankets laced together

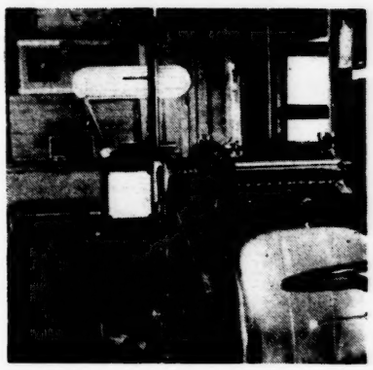

ASPHALTIC ROOFING-FELT (LAPPED 3 INCHES AGAINST WEATHER AND WIRED IN PLACE OVER MESH)
MINERAL WOOL BLANKETS
MOLDED INSULATION
50% CAUSTIC SODA 140° F 3" DIA
STEAM 340° F 2" DIA
COMPRESSED AIR 60° F 2" DIA
JOINT SECURED WITH #16 GAGE GALVANIZED WIRE
WIRE MESH
INSULATION-WITHIN-INSULATION ON PARALLEL OUTDOOR PIPE LINES

with 16-gage galvanized wire. Asphaltic roofing felt was wrapped around the entire surfaces, lapped three inches against the weather and bound on about six inch centers with galvanized wire.

RESULT: The process lines were protected both from freezing and overheating. The steam line was sufficiently insulated by the double layer to prevent wasting of heat to the atmosphere. Overheating of the process lines during the summer was also prevented.

Window Unit Cools Special Truck

PROBLEM: A print shop on wheels is operated by the International Printing Equipment Co. of Detroit, as a sales demonstration truck for printing equipment. A Dodge route-van with custom-built body is panelled in mahogany and furnished with a collapsible writing table, upholstered benches, closet space and a complete demonstration model of a printing press. The combination of press, motor-generator, and enclosed panel truck created unfavorable summer conditions during demonstrations.



SOLUTION: A York window unit air conditioner was installed in the rear of the truck and coupled with a thermostatically controlled heating system.

RESULTS: Truck temperature is kept comfortable winter and summer. Demonstrations in custom-built body increased sales so rapidly the company plans to buy a fleet of seven more.

Air Conditioners Control Mushroom Growth

PROBLEM: The Ohio Mushroom Company in Lima, Ohio, found it necessary to control the rate of growth of mushrooms by regulating temperature. The commercial variety of mushrooms grow from a tiny button to a full size mushroom in 22 days at 50F, 10 days at 60F and 6 days at 70F. Thus commercial mushroom culture can become a controlled industrial process when growing temperatures are closely controlled.

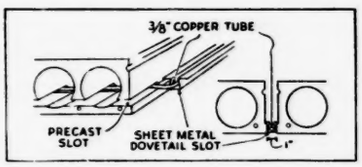
SOLUTION: Two 10-ton self-contained Typhoon air conditioners and one 20-ton Typhoon evaporative condenser were installed in the Ohio Mushroom Company's growing houses. Each 10-ton unit is used to control temperatures in each of two rooms. Four branch ducts from each unit run along ceilings. Mushroom beds are stacked seven high to a height of about 14 feet. Temperatures in the growing rooms are moderated according to the growing cycle and market requirements.

RESULTS: Close control of the growing rate of mushrooms is maintained. Zone control permits accurate temperature regulation with fluctuating localized loads.

Pre-Cast Concrete Aids Radiant Heating

PROBLEM: To save construction time and to provide for ceiling radiant heat in a five-story apartment in Chicago using concrete floors and roof.

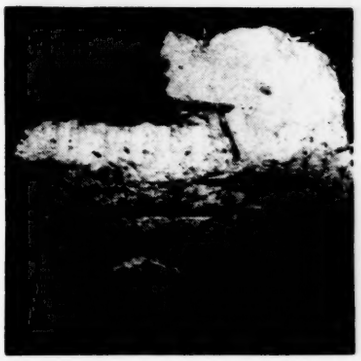
SOLUTION: Flexicore slabs, pre-cast, long-span concrete units, were used. Slabs have a smooth paneled under-surface requiring only paint to make a finished ceiling on the lower floor and a smooth floor above. Ceiling hot water radiant heat was provided by copper tubes resting in sheet metal dovetail slots placed between Flexicore slabs. Space above slot was grouted. The underside of the slot was painted same as underside of Flexicore slab.



RESULT: One month project time was saved through use of pre-cast floors and roof instead of poured construction. Apartments have individual control systems so each tenant can select the temperature desired. Radiant heat makes floor and wall space usable through elimination of radiators.

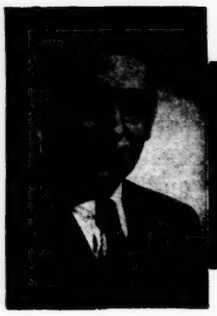
Concrete Drilling Job Solved

PROBLEM: Installation of a new air conditioning and heating system at Los Angeles County General Hospital required drilling through 8-inch heavily reinforced concrete floors.



SOLUTION: More than 25 blocks of concrete, each 18 inches square by approximately 8 inches deep, were removed from walls and floors in the building by use of Tilden rotary Konkrete Kore drills.

RESULT: Tough, aged concrete with exceptionally dense network of reinforcing bars was drilled without interference with normal operation of the hospital.



Experience is my Classroom

By T. W. REYNOLDS

• CLIMATE AND LIFE

One thousand pounds of hog develops in one year in Illinois, but start that same hog off in life in Louisiana and it will take him three years to put on the same weight. If it's a hog in Cuba, it will take five years. For further comparison and greater refinement, substitute a man for the hog, and you will find man likewise developing best in the not-too-far North, but living longer if in the South. So it behooves man to grow up and accumulate weight in the North, then to preserve that weight for years by going South; better yet, he can stay put in air conditioned quarters and live both well and long. At least, in effect, so said Dr. C. A. Mills of the University of Cincinnati in a recent issue of *Science*.

It seems that man's working efficiency is on a level as low as that of a dog, both being about 25%. The balance of 75% (or even more in very hot weather) is just waste heat and a burden which we handle well enough for short periods but which gets us down in time. At about 40F we do our best mentally and at 64F our best physically. So it is that in our northern states we get poorer marks as college students in the summer months, but do develop vigorously in mind and body in the winter months, only in later life to die too early with heart failure, diabetes or cancer in regions where the weather is too cold.

Even the white rat when put through maze tests makes but few wrong turns at 55F, many more at 75F, and plenty at 90F. At 55F he remembers, but at 90F forgets on the second test how he previously found the right turn during the first test.

• PAINTING OIL TANKS

There is some difference between the requirements of New York City and that of the Underwriters as to the painting of the outside of underground fuel oil tanks. City regulations call for two coats of red lead in addition to a coat of hot tar, asphalt or other rust-resisting material applied at the site of installation. The Underwriters' requirements merely call for a thorough coating of asphalt, tar or rust-resisting material.

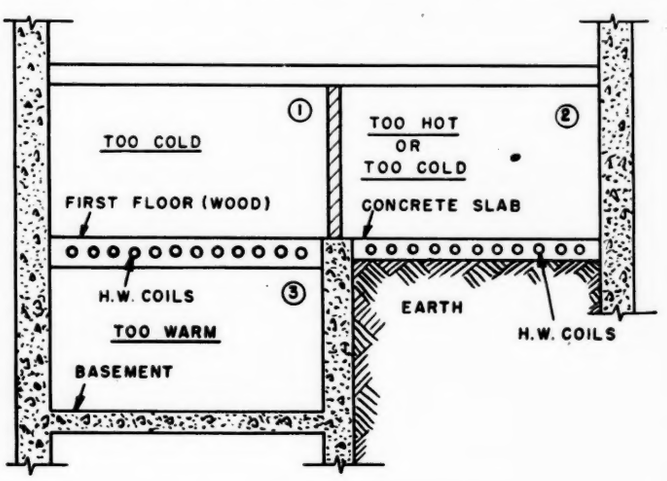
In actual practice each tank usually receives at least one coat of black asphaltum or equal at the shop, although the engineer should specify exactly what he wants and not specify just "approved." The final coat as required by city regulations is also said to be quite essential, since a tank may lay around for some time before installation and some of the paint may become chipped off in handling.

While this is the best that can be done, it leaves us still without protection for the inside of the tank. Except for tanks improperly laid so as to contact cinders or corrosive soil, most tanks corrode only on the inside rather than the outside. Corrosion usually starts at the bottom inside of the tank in very tiny perforations which enlarge rapidly. However, little within reason can be done about it.

• UNBALANCED HEAT

How a radiant heating system can become unbalanced in several respects is illustrated in the accompanying sketch. I believe that any engineer will agree that Room 1, having a coil in a wood floor, is unbalanced with Room 2, having a coil in a concrete slab which must be heated and which will have some heat loss to the ground. It is also apparent, if Room 3 is a storage room to remain unheated, that insulation or aluminum paint is required on the ceiling of this room. If Room 3 is to be heated, then both it and the room above should have separate ceiling coils. Although I say that all three rooms should have ceiling coils, there will be some who will not agree.

In the case of Room 3 it is easier for the heat to travel down through the plaster than to go up to Room 1. In any event, it is difficult to proportion heat for two rooms by one coil. In the case of Room 2 we have a concrete slab which will heat up in 6 to 8 hours—possibly 2 hours under most favorable circumstances. The wood floor between Rooms 1 and 3 will warm up or cool off in about 15 minutes. During October and early spring, while the sun may shine strongly all day, at



Unbalance of radiant heating system.

Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

night there is a sudden drop in temperature. At such times the mass of concrete floor slab can not recuperate fast enough.

Incidentally, if you walk into a room having radiant heating and you want to know whether the heat is coming from the floor or the ceiling, just draw the shades if during the day, or turn off the lights if at night. You will soon know, for though in the dark, you sense things in the same way as a blind man.

• DESIGNING TO FIT THE PURSE

Sometimes you are called on to help a friend out. He is connected with a project which, in line with the times, can't be built unless total expenditures are cut at least $40,000. You glance at the plans and specifications, and then look harder for something to reduce, for, offhand, his engineer seems not to have created a too expensive design. Eventually, by thoroughness and through the passing of time to let the whole scheme sink in, you do find things that can be changed, then lean back to wonder what this engineer could do to your plans on some of your projects.

You also wonder what he couldn't do to his own job were he asked to reduce it and given the same liberties as yourself. You know from experience on other work that the great expense of many a design is due to an over-enthusiastic building committee and its original urging to the architect and engineer to put in all the trimmings. Now that it can't be built, everyone has forgotten that it was the committee's own requirements that caused most of the expense and not those of the designers.

One of the first things that strikes you is that the proposed building, one of a large group, is located about a half mile from the powerhouse, which upon investigation has enough boiler and exhaust steam for the new building. In view of cost, the committee is now willing that the building be moved down close to the powerhouse and away goes the need for the building's chimney, boilers, breeching, pumps and blow-off tank, together with all their piping, insulation and foundations. The boiler room itself and all its lighting, plumbing and pipe railing around pits can also be done away with.

All this allows a better arrangement of basement rooms and with less excavation. The road to the building will be shortened, as will power, water and plumbing lines. A sewage disposal field is now no longer needed, rain water can drain through an open trench to a nearby lake, and a nearby forced hot water main can be tapped for heating. Heating can then be obtained with practically no operating cost, since the hot water is heated with exhaust steam from the powerhouse.

This done and you get down to minor points, the usual things that can be done, omitting anything that can be done away with forever, or at least temporarily until funds are available. Out go the valve tags, canvasing, painting and stencilling of pipes and covering and even the covering in some cases where bare pipes look better, do not overheat, and would gather less dust. Single-speed motors replace two-speed motors, individual radiator valves those pneumatically-controlled, and you also cut down on the amount of ventilation and use fewer ventilators, but of larger size.

You also use fewer pool filters, but of larger size, saving space, and reducing the number of controls and piping connections. Certain plumbing fixtures can go in later, only roughing now, while others can be changed in type or style with partitions temporarily omitted between water closets all in a row. Fewer drinking fountains and floor drains are arranged for, kitchen equipment omitted, and large drains cut down in size. Shower valves can be less elaborate.

Transformers are placed outdoors, cheaper lighting fixtures used, and those proposed to be serviced by hand winch will now be serviced by portable ladder. As to the general contract, one finds glass block where there isn't much sun, and therefore omits the glass block, also the face brick and the ceiling and plastering in certain rooms. Fixed sash is substituted for some open sash windows, and painting of mechanical work included in mechanical rather than in general contract work.

• RADIANT HEATING IN HOLLAND

A correspondent writes "You will be surprised to receive a letter from a heating and air conditioning engineer in Holland, but being a strong defender of radiant heating systems I studied several articles you published in HEATING AND VENTILATING. Though we never met I have to congratulate you for your fresh and progressive ideas and, on the other side, the fundamentals you offer your readers."

Of course, it is no surprise to the writer to receive similar correspondence from far places and even on occasion to receive good comments along with the bad. One who writes a lot must expect most anything.

But to continue his story: "You can understand that our profession in Holland is not in a position like it is in the U. S. A. This being the reason for this letter. Your article in the issue of August, 1949, on forced air rain water leader radiant heating systems was of particular interest to me, as this system offers much possibilities here. It is simple in installation, operation and in other ways. Most important in our country is the simplicity of the required air pipes, which are available here in large quantities.

"Panel heating in Holland is a monopolistic trade. You can understand that this is a very annoying situation to a young engineer and does not stimulate a healthy development of our trade. To start up as a contractor specializing in radiant heating systems, I have to own or have a license of one or two patented systems in this field, otherwise there is no chance to succeed. I see much possibilities in your forced air system and would like to patent it in this country."

There is nothing I know of which prevents him from using any ducts, square or round, or of any material. Long usage of ducts seems to preclude any chance of a patent in Holland or elsewhere; however, if any one is interested in offering this correspondent some kind of heating system for use in Holland, he has only to write HEATING AND VENTILATING to obtain the necessary contact.

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

INDUSTRIAL INSTRUMENTATION

Donald P. Eckman, of the College of Engineering, Cornell University, in his Industrial Instrumentation, reviews the principles of methods of measurement employed in industrial processing and manufacturing, for the benefit of the engineering student. While primary emphasis is given to the method rather than to the mechanism, practical details are not slighted.

The subject is considered to be a most important one because of rapid developments in industrial methods and techniques.

The problems given in the book are mainly elementary and, in most cases given, the author has considered it necessary to review the fundamentals of physics such as mechanics, thermodynamics and electricity. Included are 169 problems for the student and 247 schematic diagrams of operation principles and meter installations.

The text is arranged in the following eleven chapters: Qualities of measurement, expansion thermometers, thermoelectric temperature measurement, resistance thermometers, radiation temperature measurement, methods for composition analysis, mechanical measurements, measurement of pressure and vacuum, measurement of head and level, flowmetering, and process instrumentation.

Industrial Instrumentation, by D. P. Eckman. Cloth bound, 5½ x 8½ inches, 396 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $5.

TRANSFER OF HEAT AND MASS

This book on the Introduction to the Transfer of Heat and Mass, by E. R. G. Eckert, Air Materiel Command, Wright Patterson Air Force Base, Dayton, Ohio, and consultant, National Advisory Committee for Aeronautics, is based on an adaptation of the author's German text of the same title. However, since the original German text was written more than seven years ago, much of the material had to be rewritten.

The objective of this book, prepared at the level of the graduate student, is to arouse and widen the understanding of the physical processes and laws connected with heat and mass transfer. Formulas are derived and heat transfer problems are solved. Mr. Eckert stresses the conception of the boundary layer as the location where most of the conductive heat transfer occurs. Included are such new topics as regenerative heat exchangers, heat transfer at high velocities, and studies with the Zehnder-Mach interferometer.

Some of the chapters cover fundamental principles of heat transfer; heat conduction; heat transfer by convection; thermal radiation; and the exchange of mass.

Introduction to the Transfer of Heat and Mass, by E. R. G. Eckert. Cloth bound, 6 x 9 inches, 284 pages. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price, $4.

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MANUAL OF ELECTRIC INSTRUMENTS—A new, revised edition of General Electric's Manual of Electric Instruments describes the fundamentals of construction and operating principles of all major types of electric instruments.

Prepared primarily for use in schools, the manual also is designed for men in industry who wish to gain familiarity with the electric instruments with which they work. Its thirteen chapters explain the fundamentals of such instruments as thermocouples, synchroscopes, frequency meters, and electric telemeters. The 150 pages are extensively illustrated by photographs and diagrams. Price, $1.00. General Electric Company, Schenectady 5, N. Y.

ABRIDGED BUILDING CODE — A "performance type" building code, prepared by the Building Officials Conference of America, Inc., has been published in abridged form for national use by communities which are principally residential in character, including the usual civic, commercial and educational buildings essential to community life. Its most striking feature is that it employs performance requirements rather than detail specifications. The code accepts all recognized standards of construction and specifications of material of authoritative technical agencies. Building Officials Foundation, 51 East 42nd St., New York 17, N. Y. Price, $3 per copy, paper covered; $4.50 per copy, cloth covered.

TRADE ASSOCIATIONS—The Stoker Manufacturers Association has compiled a directory of national trade associations and organizations in the heating equipment, fuels and related industries. The second edition of this directory is now available. Trade associations and organizations are broken up into special fields such as industrial and commercial equipment manufacturers, fuels, professional and engineering societies, etc. Stoker Manufacturers Association, 307 N. Michigan Ave., Chicago 1, Ill. Price, 25 cents.

SAFETY CODE FOR MECHANICAL REFRIGERATION—The 1939 edition of B9 has been replaced by the new American Standard B9 Code. This code, which is sponsored by the American Society of Refrigerating Engineers, is more comprehensive than the 1939 edition. An Interpretation Committee was formed since the code was

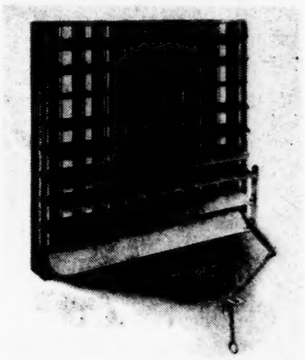
(Concluded on page 126)

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite Page 112 for securing additional information on items described in this department.

Evaporative Cooler Air Control

The Strato-Diffuser and the Modulated Volume Control, designed for use with evaporative coolers, to provide a positive means of compensating for cool and moderate "in between" dry conditions, and to prevent discomfort usually caused by on or off blower operation, have been introduced by United States Air Conditioning Corporation, Minneapolis, Minn.



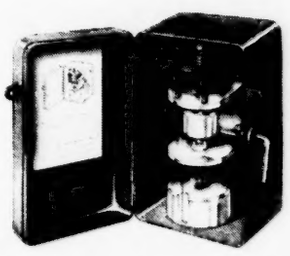
The Strato-Diffuser (upper view) is a deflecto-grille with vertical and horizontal blades individually adjustable that raises the air discharge stream above the room occupants, eliminating the chilly feeling associated with high air circulation of evaporative coolers on mild days. It allows the blowers to run without causing discomfort.

Balancing the outdoor air to the interior heat condition by precisely adjusting the volume of air discharged by the blowers, the Modulated Volume Control (lower view) does away with the chilliness on cool days caused by too much cool air. Unit is electrically operated.

For more information, write on Inquiry Card, **Item E269**

Severe Shock Shuts Switch

The Sentry automatic earthquake or explosion-operated electric switch, made by McRae Valve Corp., Los Angeles, Calif., is designed to automatically shut off electric equipment in the event of a severe explosion or earth shock. The switch is set into the existing electrical system and will instantly cut off pumps handling flammable or other dangerous material, cut off machinery, sound an alarm, and provide other safety measures. While it will positively and instantly shut off as a result of shock or explosion of an intensity great enough to cause serious damage, it will not prematurely close from normal factory vibrations, even in stamping mills.



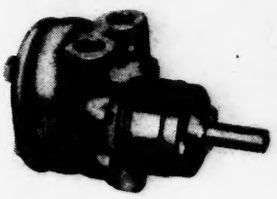
This switch is frequently installed as one unit of a multiple set-up of safety devices, so that, in the event of fire, earthquake, explosion, or other emergency, machinery could be cut off, valves on gas or fuel lines entering the building could be shut off, and other emergency valves could be opened to sprinkle dangerous areas.

For more information, write on Inquiry Card, **Item E270**

Rotary Fuel Oil Burner Pumps

Series K rotary oil pumps in ¾-, 1½-, 3- and 5-gpm sizes, tested and approved for oil burner service, are now available from Geo. D. Roper Corp., Rockford, Ill.

Particularly suitable for industrial oil burner service, they are available in either the packed box or mechanical seal designs, with or without relief valve. The ¾-, 1½-, and 3-gpm sizes are flange mounted (illustrated), while the 5-gpm size is foot mounted. All are approved by Underwriters' Laboratories.



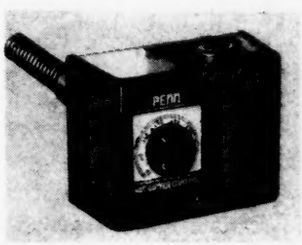
There are only slight modifications in construction from the standard fitted Series K pumps of the same sizes.

For more information, write on Inquiry Card, **Item E271**

Immersion Hot Water Control

The series 442 hot water immersion control, with liquid expansion temperature elements, has been introduced by Penn Electric Switch Co., Goshen, Ind.

Self-compensated temperature elements assure rapid response to changes in water temperatures and are not affected by ambient temperatures.



Control is available in two models. With the model 442 AT02 the control opens the circuit on a temperature rise. It is used as a hot water limit control, operating control to maintain boiler water temperatures, or to maintain water temperatures in domestic hot water storage tank.

Type 442 AT01 closes the circuit on temperature rise, and is used as a low limit control to prevent operation of equipment such as unit heaters or hot water circulators when water temperature is below the point required for adequate heating.

For more information, write on Inquiry Card, **Item E272**

Year Round Packaged Unit

A compact packaged summer cooling and winter heating air conditioning unit, controlled by the same thermostat in each season, is announced by Carrier Corporation, Syracuse, N. Y., for home, store and office installation. It measures 52 inches wide, 43 inches deep and 70 inches high.

The combination system furnishes automatic gas heating in winter and summer cooling by hermetically sealed refrigeration equipment. Known as the Carrier 38B Weathermaker, it is being produced in limited quantities this year in three capacities, 3 hp cooling and 110,000 to 150,000 Btu per hr heating; 5 hp cooling and 110,000 to 150,000 Btu per hr heating; 5 hp cooling and 165,000 to 200,000 Btu per hr heating.

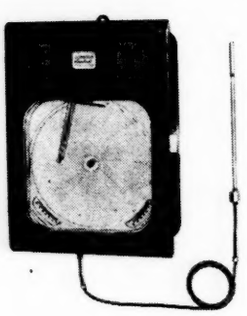
Unit, which can be serviced from the front, is so equipped that return air can be drawn into the unit from the bottom, so that it is particularly suitable for use in homes of ranch-type construction. In basement installations, the air intake can be installed at the back of the cabinet, and the flue connection can be made either from the top or side.

For more information, write on Inquiry Card, **Item E273**

Recorder-Controller

For use where a record of controlled temperature is desired, a proportional action recorder-controller has been developed by Johnson Service Co., Milwaukee, Wis.

Called the Record-O-Stat, the flexible unit is designed to control either air or liquid temperatures. It may be operated as either a direct or reverse acting controller to suit the requirements of the application.



Sensitivity of control action is adjustable to any required degree by varying the throttling range.

Unit is available with an automatic reset feature which coordinates the deviation in control with the various thermal lags inherent to the system being controlled.

The entire temperature measuring system (bulb, capillary tubing, and high-torque helical element) is liquid filled. Because of the relatively low pressure in the system, bulb walls are thinner than those required in systems using fills of other types. This improves conductivity through the sensitive portion of the temperature measuring bulb and increases the quality of recording and control.

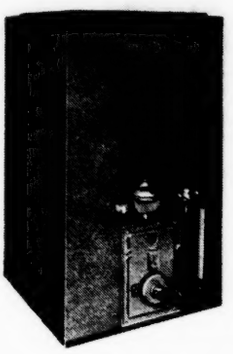
The standard copper-bulb temperature measuring element is furnished plain, with union or with union and socket, depending upon the type of mounting required. Capillary tubing is provided in any length from 5 to 200 ft. The unit is housed in a corrosion-resisting aluminum alloy case of modern design.

Five standard 12-inch charts, with various temperature ranges from 0 to 250F, are available for the Record-O-Stat. Liquid-filled temperature measuring elements with suitable charts for operation at other ranges between 125 and 400F are available on special order. Bulletin T-130 available.

For more information, write on Inquiry Card, **Item E274**

Gravity Gas Furnaces

Two new models of gravity gas furnaces are introduced by Norge Heat Division, Borg-Warner Corp., Detroit, Mich. Approved by AGA for natural, manufactured and mixed gases, these low-cost furnaces are completely automatic. They are offered in four models; currently two sizes are available.



Model GF700-90S has an input capacity of 90,000 Btu per hr and has a casing width of 27 inches, depth of 27 inches, and height of 48 inches. Model GF700-120S has an input capacity of 120,000 Btu per hr, width of 29 inches, depth of 29 inches, and height of 56 inches.

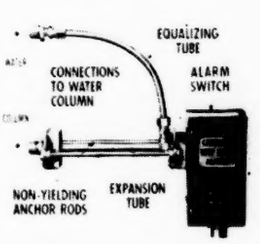
Features of the units include all-steel, permanently gas-tight combustion chamber and heat exchanger, and a cast-iron burner with 312 drilled jets to provide a tapered, cone-like flame.

For more information, write on Inquiry Card, **Item E275**

Low Level Alarm and Cut-Off

A low water alarm for boilers, the Campbell Micro-Thermal low-level boiler alarm, has been introduced by J. A. Campbell Co., Long Beach, Calif.

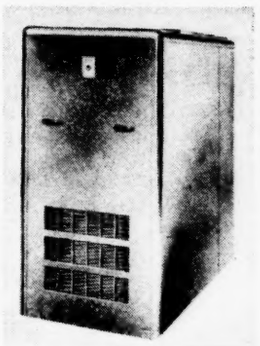
Alarm consists of a ⅜ inch expansion tube with its inner end connected to the lower end of the water column on the boiler. Outer end is connected to the upper part of the water column by means of a 5/16 inch copper tube. When the water level reaches low level, increased heat in the tube expands the tube which actuates a micro-switch. Switch is a double throw type, with one throw connected to a bell or buzzer. Other throw may be connected to a solenoid valve in the fuel line for extra safety so that when the water level gets low it will shut off the boiler fuel. Switch will throw on and off on a temperature change of only 5 deg.



For more information, write on Inquiry Card, **Item E276**

Low-Cost Oil Burning Furnace

Winterway, a basement type, completely automatic, oil-fired winter air conditioner, designed to meet the heating requirements of small- and medium-sized homes at an extremely low cost, is the latest addition to the Sunbeam line of heating equipment made by American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.



It is furnished with a flange type Arcoflame oil burner, and controls and master control switch are prewired for the convenience of the installer.

Easy assembly and installation is assured. Heating element, consisting of shell and radiator, is welded into single assembly.

Durable steel one-piece heating element consists of a correctly baffled radiator of the wrap-around type. Two simple vertical baffles help direct the hot gases to all surfaces, thus maintaining more uniform metal temperatures. Flange-mounted burner is easily attached, and blower simply slides into position.

A universal connection is provided in the flue assembly, permitting either right or left outlet. Side jacket panels have knockouts to accommodate the flue pipe. This construction allows unit to be installed either closely parallel to the wall or protruding into the basement with a minimum amount of piping used in either case.

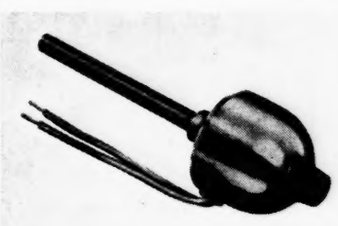
Blower motor is quiet, of constant duty type, and will not cause interference with radio or television.

Standard equipment with oil burner includes stack control and limit switch, and "timed cycling" thermostat.

For more information, write on Inquiry Card, **Item E277**

Immersion Thermostat

The Ulanet Rocket immersion thermostat, made by the George Ulanet Co., Newark, N. J., comprises a metal tube and rod of different coefficient of expansion, securely bonded to each other at one end. The opposite end of the rod operates a switch mounted on the casting. The thermo-mechanical combination is devoid of pivots and linkage and is entirely frictionless. The strain relief construction permits exposure of the instrument to extreme temperatures, both below and above normal operating temperature, without affecting the calibration.



The design principle of the Rocket has been field and time-tested in laboratories and heavy industry for over two decades. Its thermo-mechanical structure, thus proven, has now been miniaturized along sound and modern engineering principles to fit into a compact 2-inch diameter streamlined housing which lends itself to low-cost production methods.

The rating is 1,500 watts at 115-230 volts a-c, non-inductive load. It can be supplied in various adjustment ranges to operate at temperatures from —100 to 700F.

The adjustment shaft is provided with a range-limiting collar for setting the desired limits of temperature adjustment.

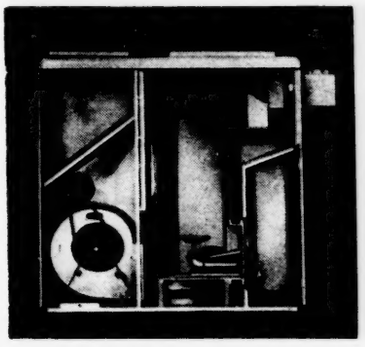
The thermostat has a Bakelite adjustment knob with numerical graduations. Pigtail lead wires pass through an insulator bushing on the side of the cover. The length of the thermo-responsive element can be supplied from 4½ to 18 inches, of various alloys to suit specific applications.

For more information, write on Inquiry Card, **Item E278**

Gas Furnaces in 5 Models

Addition of five models of gas-fired Climate Masters to its line of warm air furnaces is announced by The Hess Co., Chicago, Ill.

These units consist of forced air high-boy model 800-GH, 95,000 Btu per hr input; forced air basement models 800-G, 1100-G and 1400-G (illustrated), capacities 95,000, 125,000 and 160,000 Btu per hr input, respectively, and one gravity model 75-G of 100,000 Btu per hr input.



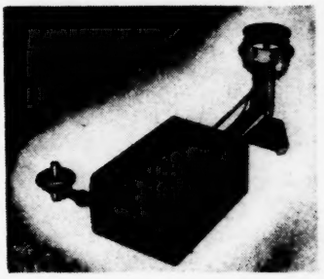
Features include baffled secondary heating surface, adjustable-drive blower, renewable filters, single port burner, stainless steel flame deflector, and automatic humidifier. Included are thermostat, fan and limit switch, gas valve, regulator, safety pilot and draft diverter.

For more information, write on Inquiry Card, **Item E279**

Adds Gas Burner to Line

A gas conversion burner has been added to its line of gas appliances by Temco, Inc., Nashville, Tenn.

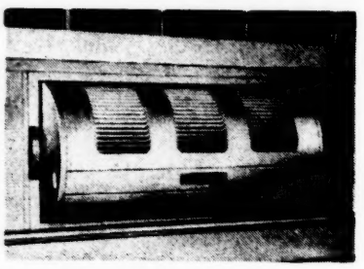
Burner has a minimum rating of 85,000 Btu per hr and a maximum of 200,000 Btu per hr. Housing supports permit accurate leveling and placement of the conversion unit on uneven floors, and the burner support allows easy vertical adjustment up to 3 inches. Telescoping mixer tube permits a wide range of horizontal adjustments. Unit is factory assembled and is equipped for automatic operation.



For more information, write on Inquiry Card, **Item E280**

Unit Exhausts or Supplies Air

The Air Pilot, a window ventilating unit which can be used either to supply or to exhaust air, has been introduced by Remington Corp., Cortland, N. Y. In one position it will bring in 100% outside air, discharging it in the room either upward or downward. When the unit is rotated, it is in position to pull smoky air or odors out of the room. Or, it can be instantly positioned to provide any combination of ventilation and exhaust, bringing in any desired amount of fresh air and expelling stale air at the same time. Or, it can serve to circulate room air exclusively.



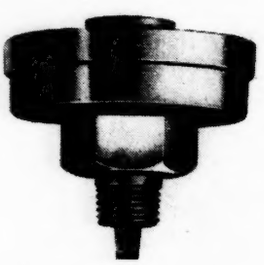
All incoming air is filtered. The unit is particularly applicable to apartment and hotel bedrooms, where it permits adequate ventilation and at the same time keeps out sleep-disturbing street noises.

It can be installed quickly and easily in any double-hung window. It operates on 110 volts a-c, without special wiring, and requires a minimum of service. If desired, units can be furnished with Sterilamps.

For more information, write on Inquiry Card, **Item E281**

Moisture Ejector for Air Lines

A pet cock which automatically ejects moisture and oil from air line traps and air compressors, is announced by the Master Equipment Corp., Dayton Ohio. The new product, called Drain Master, is two inches high and weighs 3½ ounces.



The unit operates on the build-up and relief of pressure, automatically ejecting all water and oil, twice for each operation of the equipment. One of the two models is especially designed for automotive air brake systems.

For more information, write on Inquiry Card, **Item E282**

Filter Has 28 Sq Ft Area

The latest addition to the line of Staynew dry panel filters produced by Dollinger Corp., Rochester, N. Y., is model WKE-8. This filter is 24 x 24 inches square by 8 inches deep, providing an active filtering area of 28 sq ft.

The medium most generally used in this filter is Feltex paper either six or ten-ply. Other media are available for special conditions. The complete unit consists of a die-cut and stamped heavy steel cell and frame with heavy galvanized screen being used as a permanent form to support the filtering medium. Lifting handles and cam type locking latches are supplied as standard equipment. A mechanical loading machine is available for quick, easy loading of replacement media.

For more information, write on Inquiry Card, **Item E283**

Heavy Wall Plastic Pipe

A new pipe in its line of plastic pipe which features higher burst pressure (260 lb per sq in.) and increased resistance to suction collapse, designated Carlon EX, and marked with a red stripe, is announced by Carter Products Corp., Cleveland, Ohio.

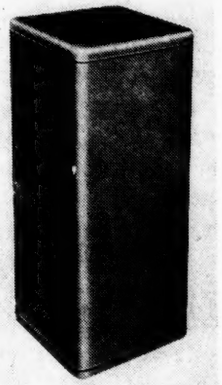
It features flexibility, light weight, and absolute resistance to rot, rust, and electrolytic corrosion. It is recommended for handling liquids intended for human consumption, as well as for conveying industrial processing solutions, wastes, and highly corrosive gases and vapors. It can also be used for air ducts, exhaust systems, or electrical conduit.

Rapid, low-cost installation is possible with this new pipe because of its flexibility, light weight, and ease of connection. A 100-foot section of 2-inch diameter pipe weighs only 61 lb. It is furnished in standard pipe sizes, 2, 2½, 3, 4, and 6-inch diameter. It can be coupled quickly and easily by molded plastic fittings.

For more information, write on Inquiry Card, **Item E284**

Dehumidifier for Damp Spots

The Aqua-Sorber, a mechanical refrigeration type dehumidifier, has been placed on the market by Aqua-Sorb Corp., East Orange, N. J. Device is especially intended for removing moisture from the air to prevent rust, mold, mildew, and other damage caused by dampness.



Air outlet is at the top from a four-way air diffuser (see illustration).

Cooling is by a 1/5 hp hermetically-sealed compressor using Freon-12. Coils are circular and made of finned aluminum tubing. At the bottom of the device a 12-quart bucket catches the moisture, or a permanent drain can be provided through a hose.

Fan is four-bladed, aluminum, 10 inch. Cabinet is of heavy gage Bonderized steel, green-grey finish, and measures 13 x 13 x 33 inches.

For more information, write on Inquiry Card, **Item E285**

Cooling for Warm Air Systems

Model HAC-200 Yorkaire Sealed Circuit Conditioner has been developed by York Corp., York, Pa., to permit refrigerated air conditioning to become a part of a forced warm air heating system in a home. The regular heating air ducts and furnace fan are used without the need for building alterations.

Two 1 hp hermetic compressor units are employed, each with a complete hermetically sealed refrigerating circuit. Two filters 1-inch thick are placed to clean the conditioned air. A thermostat automatically controls the operation of these circuits so that either one or both circuits are used, depending upon the amount of cooling required.

Motors, which are designed for 230-volt, single-phase, 60-cycle operation, have a stop-starting relay to prevent both motors from starting at once and have built-in over-load protection.

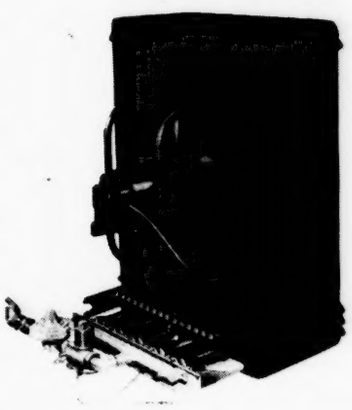
Although it is installed as part of the heating system circuit, it is a separate and distinct unit. Five other size models are available. The small units are air cooled and the large ones are water cooled. System can be used apart from the heating arrangement.

For more information, write on Inquiry Card, **Item E286**

Gas-Fired Unit Heater

A new line of gas-fired unit heaters has been announced by The Trane Company, La Crosse, Wis. The heaters are produced in 7 sizes with capacities from 50,000 to 210,000 Btu per hr input and 700 to 2,700 cfm.

Engineered for efficient combustion of either natural, manufactured, mixed or liquid petroleum gas, the unit's heat generator includes burner heads and mixing tubes of one-piece cast iron construction. This eliminates the customary joint between the two parts. Burners, pilot and control valves are combined in one drawer-type assembly.



A high limit switch prevents overheating, while both gas main and pilot light cut off automatically in case of failure. The unit's fan may be controlled by a room thermostat.

Heart of the heater is the Torrid Tube heat exchanger. Its steel tubes, generously sized for easy air passage, are rolled into heavy end sheets, boiler tube style, and fortified with additional outer and inner rolled flanges. A built-in draft diverter allows back drafts and updrafts to by-pass the burner assembly without affecting the burner's operation.

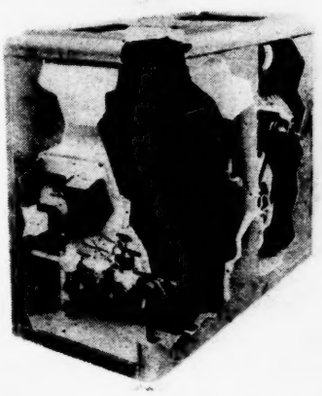
The quick-mounting casings are functional with no chrome trimming. Minimum controls are visible. The streamlined appearance blends with the architecture of shops, stores and showrooms, while the sturdy construction is suited to factory or garage. All casings are bonderized.

Full performance data, specifications and construction details are contained in Bulletin DS-347.

For more information, write on Inquiry Card, **Item E287**

Packaged Gas Air Conditioner

The Vikimatic gas-fired basement type winter air conditioner has been added to its line by Viking Mfg. Corp., Cleveland, Ohio. Available as a package, the gas basement unit is assembled, wired and test-operated at the factory to minimize adjustments at time of installation. Units are shipped ready to install and connect to fuel and electric lines.



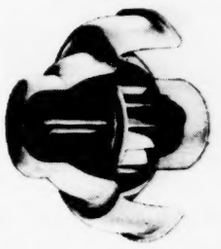
Four models are available in capacities from 78,000 to 125,000 Btu per hr input. Generous air spaces and radiator shields keep cabinet cool and increase the efficiency of the heating surface.

Heat exchanger is of heavy gage steel, electrically welded, and gas tight, with a multiplicity of wedge-shaped heat absorbing sections. Burners have raised drilled ports. Blowers are quiet, slow-speed, multi-blade, centrifugal type with resilient mounting. Units bear seal of approval.

For more information, write on Inquiry Card, **Item E288**

Exhauster Set on Outside Wall

A new line of explosion-proof wall exhausters is being offered by Jenn Air Products Co., Indianapolis, Ind.

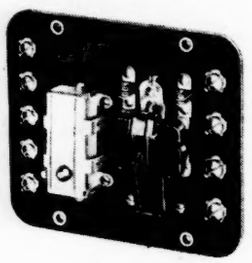


These units are flanged directly to the outside wall so that the motor is mounted outside the air stream. The entire unit is on the building exterior, away from possible explosive concentrations. The housing is constructed of aluminum; non-ferrous centrifugal impellers are directly connected to the ball-bearing explosion-proof motor. Similar units are available for roof applications.

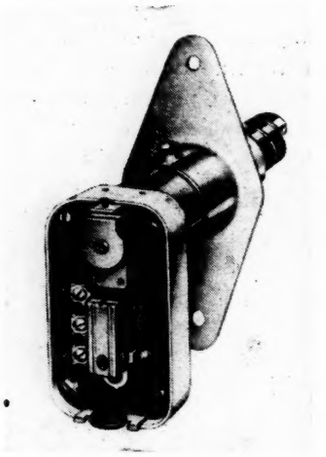
For more information, write on Inquiry Card, **Item E289**

Burner-Mounted Primary Relay

A new two-piece stack control, in which the primary relay is an integral part of the oil burner, presents many advantages never before available to the installer, according to the manufacturer, Penn Electric Switch Co., Goshen, Ind.



The primary relay (top view) is factory installed and completely pre-wired by the burner manufacturer. The stack unit (lower view) is a simplified combustion control requiring only low voltage wiring. This results in easier, simpler installation and saving in time, material and money.

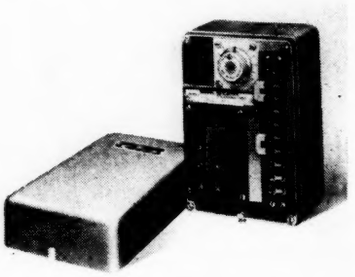


The two-piece control is a space saver in crowded quarters. Not only is the electrical hook-up simplified, but location of the stack switch reset button on the burner makes access to the stack unnecessary after installation. It is made for both intermittent and continuous ignition and operates on 115-volt, 50- or 60-cycle electrical service.

For more information, write on Inquiry Card, **Item E290**

Timer Made in 3 Time Ranges

A compact electronic timer which provides automatic control of operation, limit, and sequence timing for industrial processes has been announced by General Electric's Control Division. It is available in three time ranges: .06-1.2 seconds, .6-12 seconds, and 6-120 seconds.



The new timer features a detachable back plate which mounts directly on a rigid conduit or any flat surface. Wires are brought to the back plate and pulled through, and the timer is then mounted on the plate by means of four screws. Wiring to the terminal boards completes the installation. Space between the terminal board and the cover provides adequate room for all front-connected wiring, including that for the accessories. In addition, a dual set of contacts on the timer permit control of two operations on the same time schedule.

The relay armature is the only moving part. The G-E 6J5 electronic tube in the timer is a standard model readily obtainable at most radio stores.

Mechanical wear, it is claimed, is reduced to a minimum with this electronic device which can control the duration of a heating process, and which can be used for sequence timing with two or more timers in combination.

For more information, write on Inquiry Card, **Item E291**

Single-Phase Motor

For use where a constant-speed high-torque single-phase motor is required in large ratings, a new repulsion-induction motor has been announced by General Electric's Small and Medium Motor Divisions. Motor, part of the Tri-Clad line, combines the high starting torque of the repulsion motor with the constant-speed characteristics of the induction motor.

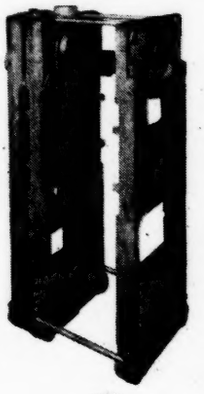
Designated as Type SCR, the motor is available in 5, 7½, and 10 hp ratings, all 1,800 rpm. The 5 hp unit operates on 115/230 volts, while the other two use 230 volts. Typical applications include air and refrigeration compressors, pumps and stokers.

To assure good alignment between stator and rotor, the ball bearings are mounted directly in the end shields of the new motor. Improved brush holders give good brush stability, and brushes and rigging are easily serviced. Efficient cooling is provided by a single large-diameter cast-aluminum fan.

For more information, write on Inquiry Card, **Item E292**

Oil-Burning Boiler for Homes

A wet base cast iron boiler, designed for oil burner installations in residences, has been introduced by Utica Radiator Corp., Utica, N. Y. The boiler is designated as the Series 1, 15-inch, and is available in five sizes with capacities ranging from 305 to 705 sq ft of steam radiation, or from 565 to 1,260 sq ft of hot water radiation, all ratings being I-B-R.



The photograph, which shows three sections removed, illustrates the 9-inch nipples connecting the individual sections. Here, in the hottest part of the boiler water, is an ideal location for the large capacity tankless heater.

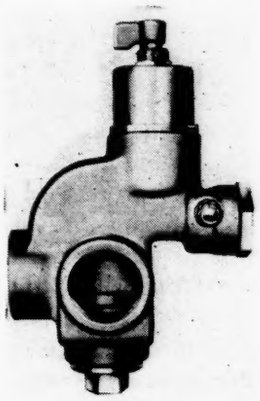
Window in insulated jacket provides a view of the electrically lighted burner compartment.

The tankless heater has a capacity of 3 to 5 gpm. Boiler is available with an extended jacket to house both boiler and burner.

For more information, write on Inquiry Card, **Item E293**

High Capacity Mixing Valve

The T-70 Tempering Controller, a new automatic hot water mixing valve which has large capacity and gives the exact hot water temperature, has been placed on the market by Symmons Engineering Co., Boston, Mass. For example, it can be set to deliver 180F water to one service, or 120F water to the rest room, or any intermediate temperature for such other purposes as may be desired.



The device is said to be unique in that it is operated by a thermostatic solid fill bellows mounted out of the water in a protected chamber subject only to atmosphere. To this thermal element is attached 72 linear inches of liquid fill copper tubing which is located in the mixing chamber. Temperature changes in the mixing chamber produce hydraulic action to the external thermal element that actuates the valve.

The valve maintains constant discharge temperature variations. It automatically compensates for all normal pressure fluctuations. A specially calibrated dial eliminates guesswork in setting temperatures from 90 to 180F.

The valve illustrated has 1½ in. connections and delivers approximately 65 gpm at 50 lb per sq in. Smaller models are available to deliver from 20 to 50 gpm.

For more information, write on Inquiry Card, **Item E294**

Gas-Heated Furnaces, 5 Models

Delco-Heat Gas Conditionairs are being produced by Delco Appliance Division, General Motors Corporation, Rochester, N. Y. Five models are available with input capacity from 62,500 to 210,000 Btu per hr; units are for house heating.

Furnace uses a multi-section heat transfer system with electrically welded steel Multi-Rad radiators and double ribbon-type burners functioning as a unit.

The heat transfer unit is a series of individual drawn-steel radiators arranged vertically in parallel series to provide maximum total radiation surface. A stainless steel inner-baffle retards the rise of the burning gas, resulting in a maximum of heat being transmitted to the air stream moving upward along the outer surfaces of the radiators. Unit is available both in 12 and 16 gage steel. All joints are seam-welded.

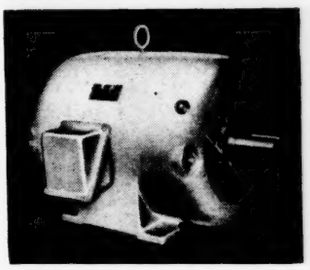
The ribbon-type burner produces a quiet, efficient flame through many ports formed by the interlocking arrangement of stainless steel ribbons in a solid cast iron housing.

Other features include a built-in draft diverter, safety pilot and a rubber mounted centrifugal blower operating in conjunction with a spun glass filter.

For more information, write on Inquiry Card, **Item E295**

Motors for Process Work

A full line of cast iron frame totally enclosed fan-cooled motors, which are available in ratings from 5 through 250 hp in both standard (type EP) and explosion-proof (type JP) designs, has been announced by the Wagner Electric Corp., St. Louis, Mo. These cast iron frame motors are especially suitable for applications in chemical plants and similar industrial plants where corrosion is a problem, either because of the nature of the materials processed or because the motors must be installed outdoors.



The blowers used on type EP motors are of malleable iron; those used on type JP motors are of non-sparking bronze. On all except the largest ratings, blower design permits operation of the motors in either direction of rotation.

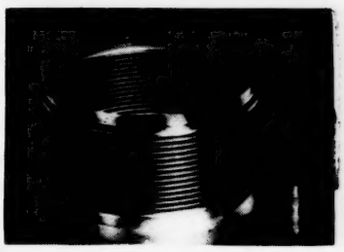
Bearings are prelubricated with the right amount of the correct grade of grease, and can be re-lubricated when necessary. Stator laminations are isolated from the air stream by the cast iron inner frame which completely surrounds them.

The rotor squirrel cage is of aluminum, cast under heavy pressure. Each rotor is dynamically balanced to insure freedom from vibration.

For more information, write on Inquiry Card, **Item E296**

Stainless Steel Bellows

Stainless steel bellows, available in a complete range of sizes, are being produced by Chicago Metal Hose Corp., Maywood, Ill., for use where problems of pressure, high and low temperatures, and corrosion are factors. They are especially suited for applications of control devices and instrumentation, such as regulators, valves, steam traps, shaft seals, expansion connections and flexible connector for misalignment.

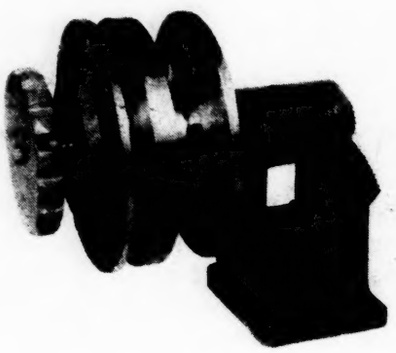


Stainless steel bellows are manufactured in single and multi-ply construction and various lengths, dependent upon application requirements. Bellows or bellow assemblies with standard fittings or fittings to customer's specifications can be supplied.

For more information, write on Inquiry Card, **Item E297**

Control for Small HP Motors

The rate of speed of a fractional hp motor can be easily changed and set by a simple knob movement provided by the Fra-Sure variable speed transmission made by Frazier & Son, Belleville, N. J.



An automatic speed locking device which keeps the pulley in the desired position throughout the entire 3 to 1 ratio, is a control against speed slippage. Operating components consist of a double grooved pulley on a floating type jack-shaft, with one groove of the pulley driven by the motor and the other groove driving the machine by V-belts. Flanges are accurately machined aluminum to prolong belt life.

For more information, write on Inquiry Card, **Item E298**

Warm Air Round Supply Outlets

Round ceiling outlet No. 500 has been introduced by United States Register Co., Battle Creek, Mich. The outlet, designed especially for residential installations with round or square ducts, is available in five standard sizes and two types of finish.

Outlet is furnished with sponge rubber gaskets and is attached to ceiling or square attic duct with screws. When used with round duct branch lines, ceiling outlet should be used with a round installation frame. Standard package contains one outlet and the round installation frame.

Available in 6, 8, 10, 12 and 14-inch sizes, and with prime coat metallic finish or in brushed or polished cadmium or medium bronze.

For more information, write on Inquiry Card, **Item E299**

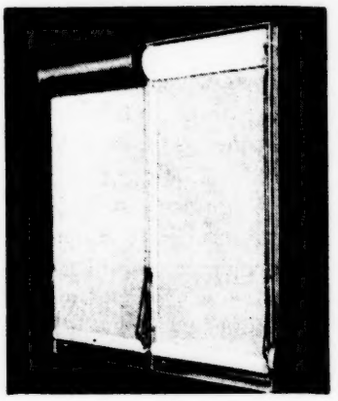
Metal Coat Avoids Rust

The Metco systems provide pure zinc or aluminum coatings properly treated to withstand various corrosive conditions such as may exist in refrigeration equipment. The pure zinc or aluminum is applied directly to the steel base with standard metallizing equipment. In most systems, the zinc or aluminum is given a specific organic treatment depending on the service requirements. The technique was developed by Metallizing Engineering Co., Inc., Long Island City, N. Y.

For more information, write on Inquiry Card, **Item E300**

Automatic Dry Type Filter

The Auto-Airmat, made by the American Air Filter Co., Inc., Louisville, Ky., is an automatic dry type air filter designed primarily for cleaning air having a high lint content and for providing an easy means of disposing of the collected material.



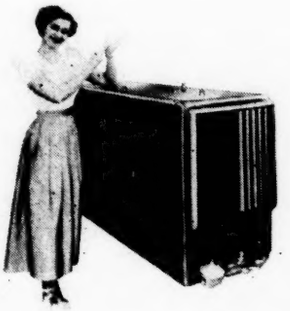
It is built in vertical sections, 3 ft 8 in. wide and in heights from 5 to 13 ft by 4-inch increments. A single ply of airmat paper, from a roll at top of the casing, travels down the face of the filter on a rotating screen and is automatically rerolled at bottom of the casing. The movement of the supporting screen is controlled by a pressure switch. When lint and dust deposited on the exposed airmat paper causes the resistance to air flow to rise to a predetermined point, the pressure switch closes a circuit to the drive motor. The drive motor rotates the screen until a sufficient amount of clean airmat paper is introduced to the air flow to reduce the resistance. The maximum resistance setting may be adjusted for any operating condition. The dust and lint removed from the air is rolled up in the solid airmat paper for convenient disposal.

Structural and operating details are given in Bulletin No. 234.

For more information, write on Inquiry Card, **Item E301**

Horizontal Gas-Fired Furnace

An attic horizontal forced air furnace, for heating homes, stores, and industrial buildings, has been developed by Palmer Mfg. Co., Phoenix, Ariz. It can function as an attic furnace, a suspended unit heater, a forced air furnace, a floor furnace, or a central basement heating unit, and is available in three models with input ratings of 65,000, 100,000, and 130,000 Btu per hr. It can be easily installed with supporting brackets or placed on a platform. A four-way directional grille with adjustable vanes is optional equipment.



Motor and blower assembly are mounted on thick rubber cushions for quiet operation. Unit has oversize blower, air space insulation between cabinet and casing, and an attractive baked hammertone enamel finish.

For more information, write on Inquiry Card, **Item E302**

Hot Water Circulator

A circulator for forced hot water heating systems, to provide high capacity performance for high resistance installations, has been developed by Taco Heaters, Inc., Providence, R. I.

This unit, Model HDH, is said to be exceptionally quiet in operation. It is equipped with a porous bronze bearing, rotary seals, cast bronze balanced impeller with stainless steel shaft, rotatable body, two bolt interchangeable flanges, and motors which incorporate overload protection. Circulator is supplied with ¾-, 1-, 1¼-, or 1½-inch interchangeable flanges. This unit, which will pump 20 gpm against a 10 ft head, regardless of flange sizes used, is designed for easy servicing.

For more information, write on Inquiry Card, **Item E303**

Burner for Cat-Cracked Oil

The CO-2 oil burner, designed to burn catalytically cracked oils, is being produced by Nu-Way Corp., Rock Island, Ill. Feature is a new type combustion head which is said to eliminate operational troubles.

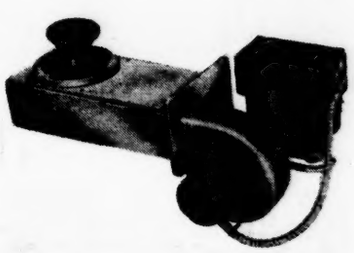
Housing is of sand-cast aluminum and forms the streamlined exterior which is finished in gray and black baked enamel. Burner is available in two capacities: Model CO-2 is rated at 0.75 to 2 gph and Model CO-6 at 2 to 6 gph. Designed for easy servicing, the new burner has a large rear opening for quick access to parts and an inspection port for use in checking the flame.

For more information, write on Inquiry Card, **Item E304**

Small Home Burners, 3 Sizes

An improved design, 1950 model, Ball Flame automatic mechanical draft oil burner for small homes is announced by Kresno-Stamm Mfg. Co., Palisades Park, N. J.

Major improvements made in the new model include: continuous blower operation, a new electric control head for automatic oil-air regulation, a sensitive thermostat, and special simplified mounting plates for quick installation to any standard furnace or boiler.



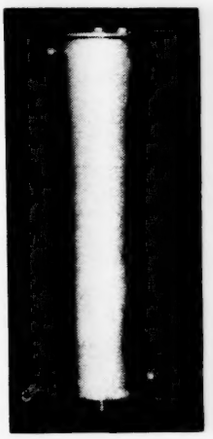
The improved model is available in three capacities: BF-1, with a maximum firing rate of 0.60 gph; BF-47, with maximum firing rate of 0.75 gph; BF-60, with maximum firing rate of 1.0 gph. Each unit is available in three standard lengths.

For more information, write on Inquiry Card, **Item E305**

Air Dryer is Water Cooled

An air dryer for compressed air lines, the WC-636, developed by The Gasflux Co., Mansfield, Ohio., combines the functions of an aftercooler and a mechanical dryer in a single unit.

Dryer has an outer shell of 6 inch O.D. seamless steel tubing and a removable inner shell or cartridge of sheet metal, packed with Fiberglas. Incoming air must first pass downward between the inner and outer shells, thus trapping out entrained moisture or oil, and then passes upward through the Fiberglas, the full length of the cartridge in order to reach the outlet valve. The Fiberglas acts as a baffle and is non-absorbent. Drying component is encased in a water jacket which cools the incoming air and greatly increases the condensation of the water vapor.



If it is desired to remove the water vapor as well as entrained moisture from the line, it can be done by installing an additional dryer charged with a chemical drying medium and which will not require a cooling jacket.

For more information, write on Inquiry Card, **Item E306**

Low Speed, Direct Drive Fan

Series 16 ventilating fans made by The Moore Co., Marceline, Mo., are furnished in diameters from 3 to 5 ft, with capacities from 11,000 to 30,000 cfm. These direct drive units provide high performance against moderate static pressures.

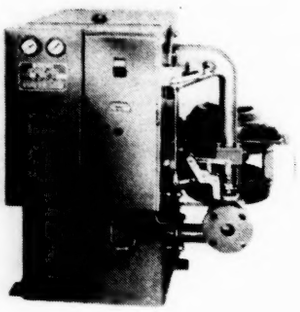
The motor, which was designed specifically for low speed fan operation, is completely enclosed within the hub and housing. Oversized, permanently sealed silicone lubricated ball bearings require no further attention. No outside air is circulated through the motor enclosure; all cooling is accomplished by heat transfer through the metal of the hub and housing. There are no passages to clog.

For corrosive applications, fans may be constructed of any workable sheet metal. Descriptive literature is available.

For more information, write on Inquiry Card, **Item E307**

Space-Saving Vacuum Pump

A newly designed vacuum pump, the Model C, that saves considerable space in boiler rooms, has been developed by C. A. Dunham Co., Chicago, Ill.

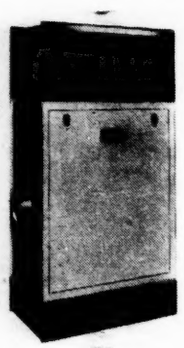


This pump is manufactured in single or duplex units for capacities from 2,500 to 20,000 equivalent square feet of radiation. It requires minimum space for (1) the pump itself is extremely compact; (2) the centrifugal pump and electric motors are mounted on the side of the vacuum pump, well above the floor level. This not only saves floor space but gives increased protection from surface water and splash of floor cleaning operations.

For more information, write on Inquiry Card, **Item E308**

Oil-Fired, In-A-Wall Furnace

Newest addition to its Even-Temp line of oil-fired heating equipment is a self-contained in-a-wall, oil-burning furnace made by Northwest Metal Products, Inc., Seattle, Wash.



Designed for average size, budget-priced homes, the unit has a rated output of 52,000 Btu per hr. It is approved for placement directly on a wood or concrete slab floor, with no clearance between wall enclosure and furnace casing. It may be connected to abutting chimney or patent flue.

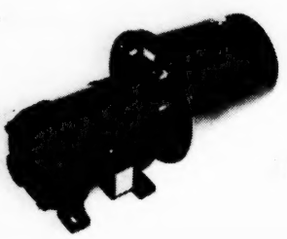
No duct work is required. Built-in cold and warm air registers are provided on both sides of the furnace to assure ample heat distribution to bedrooms no less than to living areas.

A feature of the unit is a two-speed heat circulating fan, which during warm months is utilized as a summer circulating fan.

For more information, write on Inquiry Card, **Item E309**

Midget Pump Has 3 Gal Tank

Midget hydraulic pumping units, available with either a 5 pt or a 3 gal capacity reservoir, are being made by John Dusenbery Co., Inc., Verona, N. J. A 6½ pt capacity reservoir unit is also available on special order.

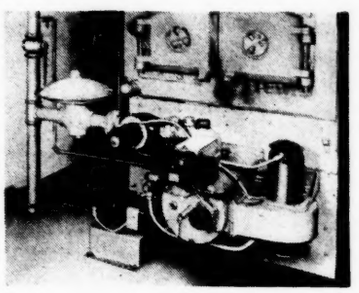


The reservoir is mounted on either an open, a totally enclosed, or an explosion-proof motor, and the pump, check valve, and relief valve are enclosed. Both reservoir and bulkhead are made of aluminum, and units with open motors have aluminum motor frames. Pressure and return line connections are for ⅜ inch O.D. flared tubing, but ¼ inch pipe thread or ¼ inch hose coupling connections can be supplied on special order. Output volumes range from 0.1 to 2.8 gpm, according to the unit selected; pump pressures are preset at the factory according to customer specifications.

For more information, write on Inquiry Card, **Item E310**

30-75 Hp Boiler-Burner Unit

Changing from gas to oil, or vice versa, by throwing switches is one of the features of the Flame King series 116 DF packaged boiler-burner unit. This automatic dual fuel unit is made in two sizes covering a range of 1½ million to 3¾ million Btu per hr input for industrial and commercial heating or processing boilers. It burns No. 3 oil, or lighter, and natural or mixed gases.



Unit is factory wired and completely assembled. It includes all electronic controls, including flame safety devices. An integral blower furnishes combustion air and an electrically ignited blast pilot assures positive main flame ignition. Gas regulators and oil pumping equipment are also included.

Operation of the burner is on-off in response to operating pressure or temperature limits set to suit. Safety devices shut off burner automatically in the event of flame failure, power failure or failure of any component parts of the burner assembly. It uses 115-volt, 60-cycle, single phase current, and is made by The North American Manufacturing Co., Cleveland, Ohio.

For more information, write on Inquiry Card, **Item E311**

Valve for Oil Burner

The Skinner Electric Valve Division, The Skinner Chuck Co., Norwalk, Conn., announces a Model V2-100 solenoid valve for oil burners, designed as a drip eliminator or shut-off valve.

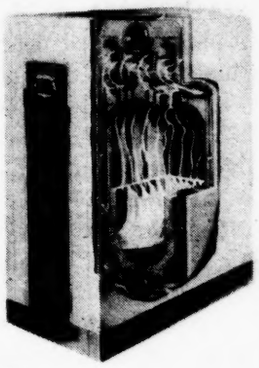
Its features include soft synthetic seat and seals to prevent leakage; spring loading for positive closing; sturdy steel construction; no brazed, welded or soldered pressure joints; all parts plated to resist corrosion. Valve measures 2¼ inches high and 2 3/16 inches wide. It weighs only 9 oz. and can be used in any position.

It is a two-way, normally closed valve and has a maximum pressure rating of 125 lb per sq in.

For more information, write on Inquiry Card, **Item E312**

Boiler, 7 Models, 4 Sizes

The US-12 All-Fuels boiler for medium size homes has been introduced by United States Radiator Corp., Detroit, Mich. It is available in four sizes with ratings from 370 to 750 sq ft of hot water radiation when automatically fired, or 270 to 560 sq ft of hot water radiation when hand fired. Boilers are also available for steam with ratings from 230 to 470 sq ft automatically fired and 170 to 350 sq ft hand fired. All ratings are net.



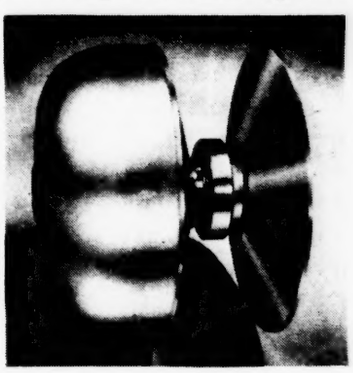
Boiler is available in seven different models to meet a wide range of needs. It is offered as an automatic oil burner-boiler unit, as an oil or gas-fired boiler alone, or as a hand-fired coal boiler. All models are furnished with flush jackets but jacket extensions are available as optional equipment.

Features of the boiler include wet base construction, large firebox, multiflues and extended fins, two flow connections in front and back sections, glass insulation, bayonet type hot water coils in tank or tankless sizes, drawer type steel ash pan on hand-fired models, and preheated secondary air supply.

For more information, write on Inquiry Card, **Item E313**

Pulley Has Many Speed Ratios

The Miner automatic variable speed clutch pulley which is automatically controlled by engine speed, and which makes possible infinite gear ratio changes on any kind of machinery on which a variable speed belt can be used, has been announced by the Driv-Way Lite Co., Denver, Colo. A 7½-inch diameter clutch is made for ½-1⅛-inch diameter shafts.



The new automatic clutch is centrifugally operated. In one of the two pulley halves, which operates along a central shaft connected to the engine, are several steel balls. When the speed of the engine is increased, centrifugal force of the steel balls pushes against the pulley half, forcing the pulley halves together, thereby carrying the belt up from the pulley shaft and automatically changing the engine from a low to a high speed ratio.

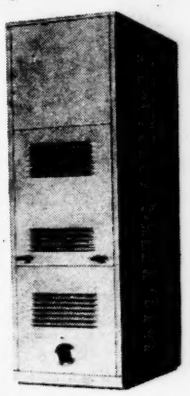
The belt revolves, on the other end, on a similar pulley which operates by spring action rather than centrifugal force. The action of this pulley is determined by that of the main drive pulley. When the pulley belt is resting high between the closed pulley halves of the drive pulley, it is low on the secondary pulley, and the engine is in high speed. When the opposite is true, the engine is in low speed.

Ratios, using this new automatic clutch pulley, can be increased or reduced, depending upon the width of the belt used.

For more information, write on Inquiry Card, **Item E314**

1951 Line of Gas Furnaces

The 1951 series 3202, 3203 and 3402 gas winter air conditioners, featuring a high efficiency heat exchanger, is now in production by Rheem Mfg. Co., Chicago 29, Ill. These units are available in sizes ranging from 60,000 to 150,000 Btu per hr input. Illustration shows the series 3202.



The heat exchanger is contoured to fit heat travel so that it is more thoroughly wiped by the hot gases, assuring even distribution of heating element temperatures. This unit is electrically welded and airtight and is guaranteed for 10 years against burning or rusting out. All other parts in the air conditioner are guaranteed for 1 year.

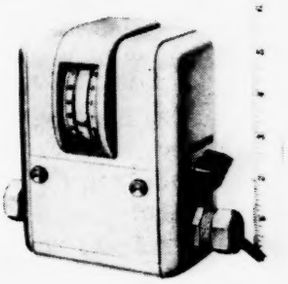
The company is also making the series 3200 gas winter air conditioner in sizes ranging from 168,000 to 350,000 Btu per hr input for installations requiring larger capacities.

Large capacity blowers float on rubber to eliminate vibration. Surface is curved to eliminate expansion noise. Quiet flame extinction is assured by providing a sloped burner.

For more information, write on Inquiry Card, **Item E315**

Time Control Set by Dial

Four different time interval combinations may be set from the outside by a single dial control on the Model X-1000 made by Basic Products Corp., Fort Wayne, Ind. Each interval is variably controlled and infinite from 5 minutes up to the length of period selected.

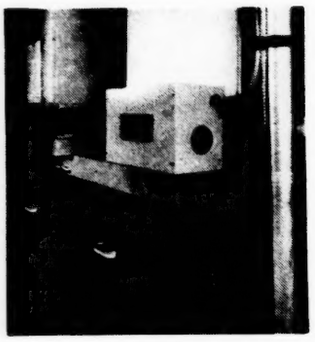


Starting time may be set for any time of day or night and by a toggle switch. The controlled time can be either time on or time off. Setting is done with two dials, one of which shows actual time of day. There are no inside pins to set, nor cams and levers to adjust. The working mechanism is driven by a synchronous motor. The junction block is readily accessible by conduit from two sides and bottom. It operates on either 110 or 220 volt a-c.

For more information, write on Inquiry Card, **Item E316**

Oil Burner-Furnace Control

The Emco Dual Comfort control for winter air conditioning systems has been introduced by Emco Products Co., Orange, N. J. Control consists of a box 12 x 6 x 8 inches, to which existing thermostats and limit controls are wired. It is available in both manual or automatic models, the latter being controlled by an outside thermostat.



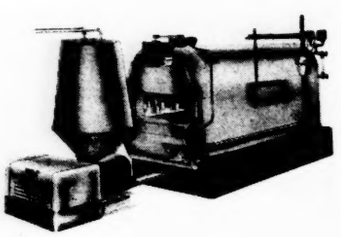
The purpose of the control is to iron out inside air temperature fluctuations caused by on and off burner action. The control allows the fan to be operated by a limit switch and the burner by a thermostat in mild weather when the temperature is above 50F. When the weather is below 50F, the control allows the limit switch to operate the burner; the room thermostat operates the fan so that the furnace is maintained at a relatively high temperature and is not cooled down or over-heated.

Change-over is manual, except that use of an outside control allows the change-over to be made automatically.

For more information, write on Inquiry Card, **Item E317**

Pulverized Coal Burner

A burner which burns powdered coal has been developed by Blokolgas System, Inc., Detroit, Mich. The company will also process and deliver the powdered coal so that its customers will be assured of an uninterrupted fuel supply at all times.



Powdered coal, feeding through the carburetor, mixes with air and burns in suspension in the combustion chamber. Because it burns with greater combustion efficiency than other types of coal, less fuel is required and heating costs may be reduced. There are no clinkers, soot or smoke and no coal is burning when heat is not required. The burner automatically turns on and off by thermostatic control. The small ash content is collected in a receptacle in the furnace and is removed periodically, through a vacuum tube, by the same truck that delivers the fuel. No ashes are carried out by hand.

For more information, write on Inquiry Card, **Item E318**

Stud-Type Vibration Isolators

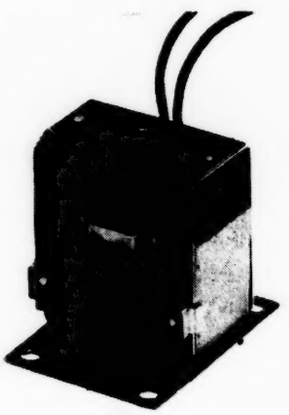
Stud-type vibration isolators for controlling transmitted vibrations, when installed either in compression or shear, are available from Finn & Co., New York, N. Y., in 44 different sizes, for load ranges from 1 to 270 lb per mount. These isolators lend themselves to use with small motors, air conditioning equipment, and many other installations.

Each mount features a floating rubber principle. A rubber cylinder is rigidly bonded to steel end plates to which studs are welded. One stud can be bolted to a foundation, the other to a piece of equipment.

For more information, write on Inquiry Card, **Item E319**

Solenoid for Short Strokes

A short-stroke solenoid, made by General Electric Co., Schenectady, N. Y., has a cast-permafil coil assembly.



Originally designed for high-speed, pilot-valve operation, the new solenoid is said to be ideal for any heavy-duty industrial application requiring a push-type solenoid with a maximum stroke that does not exceed 5/16 inch. It is available in four models, including strokes of 1/8 and 5/16 inch and two stacking thicknesses.

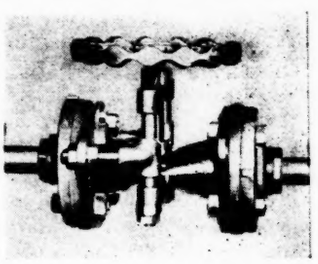
Of riveted construction, the solenoid has extra thick outer laminations. The mounting plate is of heavy plate steel brazed to the frame, and the new type push mechanism consists of a stainless-steel push pin brazed to the plunger. Comparative life tests indicate that the new solenoid will operate from 5 to 10 million times before failure.

For more information, write on Inquiry Card, **Item E320**

Pinch Valve for Process Use

A rubber pinch valve for use in the process industries has been developed by the mechanical goods division of United States Rubber Co., New York, N. Y.

When installed in pipelines carrying abrasive or corrosive mixtures, it will, it is claimed, outwear metal, and because it is flexible, will offset misalignment in pipes. No packing or repacking is required. It absorbs vibration, eliminates water hammer, and affords a positive seal in the closed position. Its metal parts can be refitted to new valve bodies, thereby reducing replacement costs. It will break up, it is said, galvanic action that may develop in metal lines.



Valves are available in abrasive and corrosive-resistant compounds, neoprene for oil resistance, butyl rubber for high heat and severe acid conditions, and pure gum stock for food and beverage conveyance.

Design of the valve is compact, with mechanism, retaining rings and pinch valve body in one unit.

For more information, write on Inquiry Card, **Item E321**

DEGREE-DAYS FOR JUNE, 1950

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 22nd Year of Publication of Monthly Degree-Day Data

City	June			Cumulative, September 1 to June 30			Heating Season[1]
	1950	1949	Normal	1949-50	1948-49	Normal	Normal
Abilene, Texas (A)	1	0	0	2208	2818	2061	2061
Albany, New York (A)	71	34	0	6902	6162	6580	6580
Albuquerque, New Mexico (A)	0	3	0	3852	4640	4298	4298
Alpena, Michigan (C)	132	100	138	7987	7124	8265	8299*
Anaconda, Montana (C)	337	281	251	8685	8897	8261	8357**
Asheville, North Carolina (C)	12	3	0	3580	3516	4232	4232
Atlanta, Georgia (C)	0	0	0	2453	2365	2890	2890
Atlantic City, New Jersey (C)	23	18	0	4470	4168	5176	5176
Augusta, Georgia (A)	0	0	0	1853	1620	2161	2161
Baker, Oregon (C)	237	205	213	7328	7800	7163	7163
Baltimore, Maryland (C)	0	0	0	3921	3670	4533	4533
Billings, Montana (A)	165	106	60	7847	7591	7119	7119
Binghamton, New York (C)	90	37	0	6369	5831	6808	6808
Birmingham, Alabama (A)	1	0	0	2240	2285	2352	2352
Bismarck, North Dakota (A)	104	77	45	10161	9125	9192	9192
Block Island, Rhode Island (C)	90	0	99	5397	4940	5788	5788
Boise, Idaho (A)	114	72	0	6118	6540	5552	5552
Boston, Massachusetts (A)	12	20	0	5558	4999	6045	6045
Boseman, Montana (C)	265	253	230	8285	8594	8425	8521**
Buffalo, New York (A)	77	39	12	6520	5925	6822	6822
Burlington, Iowa (A)	40	1	(a)	6124	6050	(a)	(a)
Burlington, Vermont (A)	61	44	3	7543	6845	7514	7514
Butte, Montana (C)	308	266	236	8910	9407	8162	8235**
Cairo, Illinois (C)	0	0	0	3497	3441	3909	3909
Canton, New York (C)	90	55	0	7853	7068	8020	8020
Charleston, South Carolina (C)	0	0	0	1394	1166	1769	1769
Charlotte, North Carolina (C)	0	0	0	2699	2451	3120	3120
Chattanooga, Tennessee (A)	0	0	0	2872	2848	3118	3118
Cheyenne, Wyoming (A)	158	176	126	7271	7840	7466	7466
Chicago, Illinois (C)	44	23	59	5924	5579	6077	6077
Cincinnati, Ohio (C)	5	1	0	4155	3992	4684	4684
Cleveland, Ohio (A)	41	26	0	5795	5435	6155	6155
Columbia, Missouri (C)	16	0	0	4704	4772	4922	4922
Columbia, South Carolina (C)	0	0	0	2057	1767	2364	2364
Columbus, Ohio (C)	19	7	0	4980	4691	5398	5398
Concord, New Hampshire (A)	76	52	54	7369	6608	7353	7353
Concordia, Kansas (C)	16	0	0	5358	5759	5315	5315
Dallas, Texas (A)	1	0	0	2079	2473	2256	2256
Davenport, Iowa (C)	28	6	0	6151	5899	6289	6289
Dayton, Ohio (A)	37	5	0	5433	5192	5264	5264
Deer Lodge, Montana (C)	292	235	235	8547	9141	8582	8672**
Denver, Colorado (C)	62	72	0	5328	6009	5874	5874
Des Moines, Iowa (C)	33	3	0	6486	6311	6384	6384
Detroit, Michigan (A)	46	31	0	6317	5828	6490	6490
Devils Lake, North Dakota (C)	154	122	96	11059	9992	9970	9970
Dodge City, Kansas (A)	12	6	0	4865	5489	5035	5035
Dubuque, Iowa (C)	35	9	0	6830	6467	6790	6790
Duluth, Minnesota (C)	232	128	216	9960	8698	9483	9483
Eastport, Maine (C)	272	188	300	7671	7227	8241	8520**
Elkins, West Virginia (A)	71	40	0	5448	5296	5697	5697
El Paso, Texas (A)	0	0	0	2143	2930	2428	2428
Ely, Nevada (A)	255	224	(a)	7558	8861	(a)	(a)
Erie, Pennsylvania (C)	44	30	0	5823	5395	6273	6273
Escanaba, Michigan (C)	175	89	138	8719	7758	8746	8771
Evansville, Indiana (A)	5	0	0	4247	4208	4244	4244
Fort Smith, Arkansas (A)	1	0	0	3109	3250	3147	3147
Fort Wayne, Indiana (A)	55	19	0	6102	5710	5925	5925
Fort Worth, Texas (A)	0	0	0	2113	2438	2148	2148
Fresno, California (A)	9	0	0	2619	2755	2334	2334
Galveston, Texas (C)	0	0	0	653	993	1016	1016
Grand Junction, Colorado (A)	32	41	0	5651	6341	5548	5548
Grand Rapids, Michigan (C)	81	23	0	6509	5891	6535	6535
Green Bay, Wisconsin (C)	97	37	0	8413	7343	7825	7825
Greensboro, North Carolina (A)	0	1	0	3470	3260	3529	3529
Greenville, South Carolina (A)	0	0	0	2849	2618	3380	3380
Harrisburg, Pennsylvania (A)	8	10	0	5122	4834	5375	5375
Hartford, Connecticut (A)	48	20	0	6001	5413	6036	6036
Hatteras, North Carolina (C)	0	0	0	1891	1891	2571	2571
Havre, Montana (C)	164	82	144	9419	8653	8700	8700
Helena, Montana (A)	250	183	171	8739	9013	7834	7894**
Houston, Texas (C)	0	0	0	852	1283	1157	1157
Huron, South Dakota (A)	61	24	0	8625	7975	8004	8004
Indianapolis, Indiana (A)	29	4	0	5305	5148	5298	5298
Jackson, Mississippi (A)	0	0	0	1729	1805	(a)	(a)
Kansas City, Missouri (A)	9	0	0	4742	4874	4956	4956
Knoxville, Tennessee (A)	1	0	0	3129	3126	3670	3670
La Crosse, Wisconsin (A)	36	15	0	8082	7392	7322	7322
Lander, Wyoming (A)	178	168	135	7898	8513	7947	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 1141]

Degree-Days for June, 1950 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 22nd Year of Publication of Monthly Degree-Day Data

City	June			Cumulative, September 1 to June 30			Heating Season[1]
	1950	1949	Normal	1949-50	1948-49	Normal	Normal
Lansing, Michigan (A)	70	31	0	6910	6417	7048	7048
Lewiston, Maine (O)	(a)	41	45	(a)	6474	7707	7707
Lincoln, Nebraska (C)	26	4	0	6038	6291	5999	5999
Little Rock, Arkansas (A)	0	0	0	2711	2847	2811	2811
Livingston, Montana (C)	233	179	142	7460	7566	7185	7245**
Los Angeles, California (C)	17	0	0	1487	1860	1504	1504
Louisville, Kentucky (A)	3	0	0	4023	3938	4180	4180
Lynchburg, Virginia (A)	0	2	0	3834	3675	3980	3980
Macon, Georgia (A)	0	0	0	1788	1770	2201	2201
Madison, Wisconsin (C)	53	27	0	7334	6929	7429	7429
Marquette, Michigan (C)	187	106	186	8712	7775	8650	8693*
Memphis, Tennessee (A)	0	0	0	2838	2818	2950	2950
Meridian, Mississippi (C)	0	0	0	1877	1822	2160	2160
Milwaukee, Wisconsin (A)	64	41	39	7155	6688	7245	7245
Minneapolis, Minnesota (A)	62	17	0	8410	7624	7850	7850
Montgomery, Alabama (C)	0	0	0	1544	1509	1884	1884
Nantucket, Massachusetts (A)	113	75	123	5744	5384	5957	5957
Nashville, Tennessee (A)	1	0	0	3311	3229	3507	3507
New Haven, Connecticut (A)	67	34	0	5763	5189	5895	5895
New Orleans, Louisiana (C)	0	0	0	775	900	1024	1024
New York, N. Y. (C)	26	9	30	4669	4250	5274	5274***
Nome, Alaska† (A)	(a)	1108	1443	(a)	13604	13058	14580**
Norfolk, Virginia (C)	0	0	0	2736	2560	3350	3350
North Head, Washington (C)	252	343	309	5212	5352	5002	5452**
North Platte, Nebraska (A)	46	31	0	6682	6804	6366	6366
Oakland, California (A)	158	87	93	3176	3370	2963	3143**
Oklahoma City, Oklahoma (C)	2	0	0	3321	3693	3613	3613
Omaha, Nebraska (A)	23	2	0	6311	6436	6131	6131
Oswego, New York (C)	86	55	63	6694	6118	7088	7088
Parkersburg, W. Virginia (C)	16	6	0	4445	4291	4775	4775
Peoria, Illinois (A)	36	37	0	5949	5765	6109	6109
Philadelphia, Pennsylvania (C)	12	1	17	4360	3969	4737	4737***
Phoenix, Arizona (C)	0	0	0	1124	1818	1405	1405
Pittsburgh, Pennsylvania (C)	16	11	0	4834	4515	5235	5235
Pocatello, Idaho (A)	153	106	60	7028	7476	6655	6655
Portland, Maine (A)	111	86	81	7470	6740	7218	7218
Portland, Oregon (C)	102	82	90	4653	4606	4469	4469
Providence, Rhode Island (C)	26	17	0	5470	4805	6015	6015
Pueblo, Colorado (A)	34	40	0	5075	5846	5514	5514
Raleigh, North Carolina (C)	0	0	0	2747	2606	3234	3234
Rapid City, South Dakota (A)	107	92	30	7938	7685	7118	7118
Reading, Pennsylvania (C)	14	6	0	4858	4456	5389	5389
Red Bluff, California (A)	13	0	(a)	2833	3019	(a)	(a)
Reno, Nevada (A)	170	114	90	5960	6741	5892	5892
Richmond, Virginia (C)	2	1	0	3315	3149	3695	3695
Rochester, New York (A)	72	49	0	6671	6110	6732	6732
Roseburg, Oregon (C)	1	0	0	3124	3858	3484	4428
Roswell, New Mexico (A)	(a)	79	114	(a)	4565	4428	3484
Sacramento, California (C)	22	5	0	2625	2981	2653	2653
St. Joseph, Missouri (A)	12	0	0	5383	5483	5161	5161
St. Louis, Missouri (C)	4	0	0	4263	4311	4585	4585
Salt Lake City, Utah (A)	57	54	0	5888	6713	5555	5555
San Antonio, Texas (A)	0	0	0	1152	1626	1202	1202
San Diego, California (A)	29	1	6	1581	1901	1645	1645
Sandusky, Ohio (C)	24	20	0	5514	5293	6208	6208
San Francisco, California (C)	238	214	195	3028	3269	2876	3264**
Sault Ste. Marie, Michigan (A)	280	147	189	9463	8352	9139	9285**
Savannah, Georgia (A)	0	0	0	1333	1099	1490	1490
Scranton, Pennsylvania (C)	58	21	0	5845	5409	6129	6129
Seattle, Washington (C)	120	138	162	4916	4923	4875	4934**
Sheridan, Wyoming (A)	149	126	120	8136	7987	8008	8008
Shreveport, Louisana (A)	0	0	0	1807	2029	1938	1938
Sioux City, Iowa (A)	47	3	0	7323	7237	6898	6898
Spokane, Washington (A)	160	132	81	7462	7541	6355	6355
Springfield, Illinois (C)	9	0	0	5035	4926	5373	5373
Springfield, Missouri (A)	19	0	0	4457	4488	4428	4428
Syracuse, New York (A)	72	37	12	6625	6033	6893	6893
Tacoma, Washington (C)	152	174	183	5275	5294	5066	5181**
Terre Haute, Indiana (A)	23	2	0	5112	4946	4872	4872
Toledo, Ohio (A)	40	23	0	6154	5750	6077	6077
Topeka, Kansas (C)	12	0	0	4887	5013	4969	4969
Trenton, New Jersey (C)	20	10	0	4853	4389	4933	4933
Utica, New York (O)	99	21	0	6940	5666	6796	6796
Valentine, Nebraska (C)	79	41	0	7642	7428	7039	7039
Walla Walla, Washington (C)	81	51	0	5501	5629	4808	4808
Washington, D. C. (C)	0	0	0	3808	3640	4626	4626
Wichita, Kansas (A)	12	0	0	4521	4868	4673	4673
Williston, North Dakota (C)	151	107	54	10270	9198	9323	9323
Winnemucca, Nevada (C)	155	73	117	6472	6961	6391	6427**
Yakima, Washington (A)	79	78	0	6536	6567	5599	5599

(a) Data not available.
†Nome data are for May.

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

NEWS OF THE MONTH

ANTHRACITE PROMOTION

spurred by heavier advertising appropriation and revitalized research.

At a conference July 11, at Wilkes-Barre, Pa., the heart of the anthracite industry, Frank W. Earnest, Jr., president of the Anthracite Institute, announced that the institute would spend within the next twelve months more than $1,000,000, largely for television and newspaper advertising. This sum will be matched by the producing companies themselves in radio and newspaper advertising.

The institute will spend an additional $600,000, largely for research activities and to acquaint users of anthracite through a personal follow-up of developments in equipment for burning the fuel. The institute also plans to give greater assistance to manufacturers of anthracite burning equipment.

With the economy of northeastern Pennsylvania largely tied to anthracite, the drive of the industry for the expansion of the sales of anthracite has the backing of the entire area. In addition to the top executives of the anthracite producing companies, representatives of the Chambers of Commerce in the area and other civic organizations were present at the start of the program. Officials of the United Mine Workers Union and representatives of retail dealers were present and pledged their assistance.

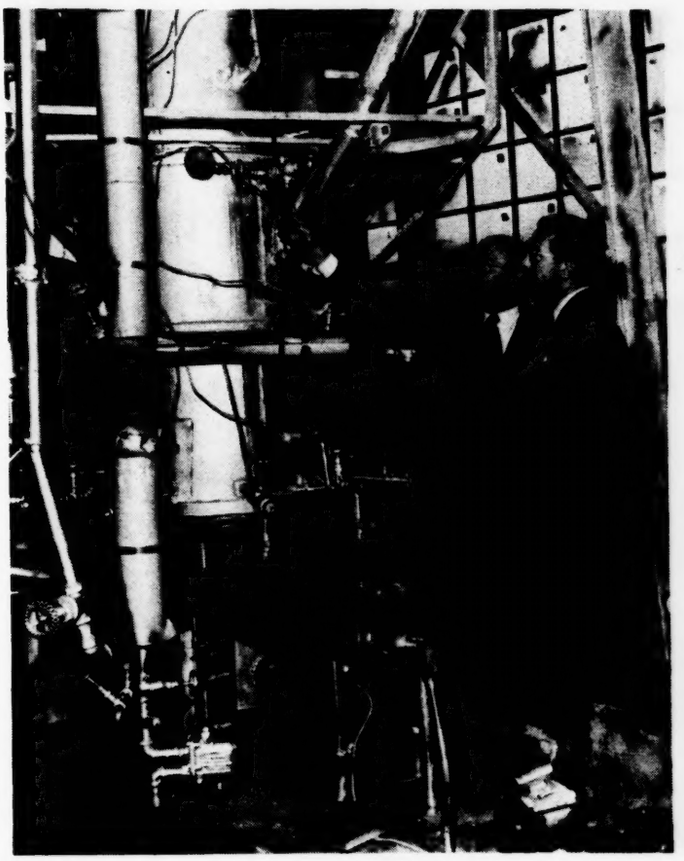
• **FAVORABLE.**—Speaking from the standpoint of production, labor, utilization and research, the hard-coal representatives noted among favorable factors the existence of adequate reserves of anthracite; nearness of the producing area to principal markets; improvements in utilization equipment; progress in research on new uses, and satisfactory labor relations.

Spokesmen said the hard-coal mines cannot economically be kept prepared only as a stand-by source of fuel to supplement oil, gas, or other solid fuels, but must assume an expanded place in the fuel field. Likewise, it was felt, the railroads, which move the bulk of hard coal, cannot be expected to maintain facilities only to meet emergency anthracite movements.

Location of the field places anthracite close to its principal markets in New England and the Middle Atlantic States, which take more than 80% of the output without need for the long-distance pipe line or water transportation required for oil and gas. The freight charge on anthracite averages $3.11 a ton, but because of the volume, the hard-coal industry is the third largest railroad customer. Annual requirements of 250 producers are more than 1,225,000 cars, and rail revenues from this source top $100,000,000 a year. Only soft-coal and iron-ore traffic are greater in rail volume.

• **LABOR.**—Assurance of a continued supply of anthracite to the public was given to operators, retailers and industrial leaders of the anthracite region by Mart F. Brennan, President of District 7, UMW.

Mr. Brennan, speaking at a luncheon sponsored by the anthracite industry, declared that labor relations within the industry have never been as good as they are today. He expressed confidence in the leadership of the anthracite operators.



Dr. R. C. Johnson, left, vice president in charge of research of the Anthracite Institute, shows Frank W. Earnest, Jr., president, a new kind of solid fuel conversion plant constructed at the institute's Wilkes-Barre laboratory. Plant is a fluidized bed gas producer which burns waste anthracite silt suspended without grates in a stream of air and gas.

Mr. Brennan's sentiment was echoed by R. E. Taggart, president of the Philadelphia & Reading Coal & Iron Co. and chairman of the Operators' Wage Agreement Committee.

The record of 80 days of idleness in the anthracite industry during the past 25 years, Mr. Taggart said, is just about 99% perfect. The anthracite industry has not a labor problem. The labor situation in our industry, if not the best in the country, is among the best.

OIL BURNER

sales advance as supplies hold ample and refining capacity grows.

Oil burner sales in 1950 may well pass the all-time record high of 880,000 set in 1947, according to A. T. Atwill, chairman of the board of Oil-Heat Institute of America. Current estimates for the year were set at

850,000 central heating units and more than 1,000,000 space heaters by OHI directors.

All estimates, however, were contingent upon the Korean situation, which might affect the sale and installation of oil heating equipment due to possible curtailments by the government or setting up allocations for steel and other essential materials.

• **GAIN.**—If the present rate of installation can continue unhampered by controls or scarcity of material, the oil heating industry is showing a 38% gain in installations over the 614,000 domestic oil burners put into use last year. About a 30% increase in space heater sales is expected over the 750,000 sold in 1949. More than half the total number of burners being sold are conversion units.

Sales in the Midwest are up on a percentage basis over the country as a whole. This advance is taking place in many middle western areas where natural gas is most plentiful and cheap.

• **SUPPLY.**—A tightening supply for oil storage tanks is reported but a critical situation is not generally expected.

Supplies of heating oils for the coming winter will be adequate to meet demands. Institute spokesmen view this situation optimistically due to reserve refining capacity capable of meeting a very heavy demand situation.

Heavier installations in rural areas and farms is evidenced, which is a change in the trend from before the war when most oil burner sales were made in towns of 50,000 or more.

Prices are "firm to slightly higher," the Institute reported.

CENTRAL SYSTEM

in modernized department store uses high-velocity chilled air in small ducts with special diffusers.

The problem faced by long established stores of equipping their existing buildings with modern air conditioning without disruption of activity and prohibitive sacrifice of sales space has been solved by Pittsburgh's Kaufmann Department Stores. The new air conditioning system serving the entire top twelve floors and augmenting the basement and main floor systems of this leading store was installed without giving up a single square foot of sales, office or storage area, without building alterations and without disturbing existing lighting fixtures, sprinkler heads or decorations.

A major feature of the $2 million Kaufmann's modernization program, the system will have an ultimate capacity of 1,650 tons of refrigeration—one of the largest to be installed in an existing store. Rather than the customary compromise of multiple unitary conditioners scattered throughout the building, one large central conditioning unit in a new penthouse serves the entire system. Instead of the usual huge, space consuming air ducts, the more than 400,000 cfm of cleansed, cooled and dehumidified air is conducted throughout the store through more than four miles of small shallow ducts at a velocity of about 30 miles per hour and discharged through 3,500 special, uniformly distributed air diffusers. Two elevator shafts in the approximate center of the building had to be "donated" to house the main vertical ducts required to supply and return the air to and from each floor, but this contribution was more than compensated by the substitution of the sixteen new high-speed elevators which were part of the modernization plan.

What is unique about the air conditioning system is its method of air distribution and diffusion. It is actually the first to utilize the high velocity or conduit principle for large interior zones, common especially to large department stores. The principle, which relies on supplying less air at colder temperatures through small ducts at consequent high velocity, enabled the network of small distributing ducts to be located alongside and flush with existing beams so as to be practically obscured. Since these branch ducts had to be of uniform size regardless of the amount of air flowing through any one portion of the duct, the air outlets had to be adjustable to discharge the required air volume at the same outlet velocity over identical areas, regardless of the air pressure behind them and without creating noticeable air noise, uneven temperatures or objectionable drafts.

Special diffusers allow uniform discharge of conditioned air regardless of position on long, uniformly sized, ceiling duct.

These special air diffusers were designed and fabricated by the W. B. Connor Engineering Corp., initially tested in its own laboratories and then "proved" in a trial bay under actual store conditions. Each diffuser discharges between 90 and 180 cfm of chilled air over an area of about 150 sq ft at an outlet velocity of 2,400 fpm and so intimately mixes the discharged air with the store air that completely uniform comfort temperature and "live" yet draftless air movement is achieved. The diffusers are adjustable to regulate the air supply to suit load and traffic conditions and are lined with fiber-glass sound absorbing material.

OK for Industrial Piping

● Revere Copper Tube is frequently recommended for conveying industrial fluids in paper mills and other process applications. This tube comes in a variety of tempers, lengths and gauges which make it suitable for a wide range of such applications as well as for heating, plumbing and air conditioning installations.

Revere provides Copper Water Tube for use with solder or compression fittings; type B Copper Tube for installations requiring outside diameters of SPS pipe and brazed fittings; Red-Brass Pipe and Copper Pipe for use with threaded fittings. Every length of Revere pipe and tube is marked with the name Revere. Always look for this mark as your assurance of fine, uniform quality.

Revere pipe and tube are handled by leading distributors in all parts of the country. The Revere Technical Advisory Service is always glad to serve you.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

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Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere

PUSH-BUTTON STATIONS

for remote control of pipeline pumps put in operation by Shell.

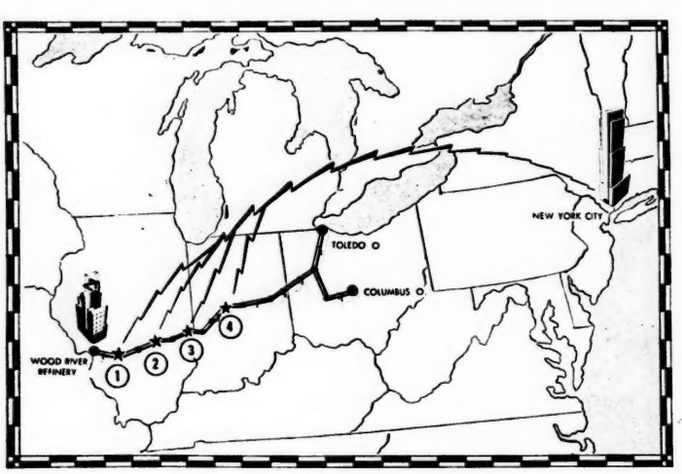
A radically new type of pipeline pumping station in which pumps may be started and stopped, valves opened and shut, and reports made automatically on operating conditions, all at the will of a man 850 miles away, was put into operation July 17 by Shell Oil Co.

• **DIAL CONTROL.**—At 2 p.m., D. B. Hodges, Shell's vice president in charge of transportation and supplies, dialed code numbers on a telephone dial attached to a teletype machine located on the thirty-fifth floor of the R.C.A. Building, New York. Seconds later, pumps were in operation at four new stations in New Douglas, Effingham, and Dennison, Ill., and North Salem, Ind.

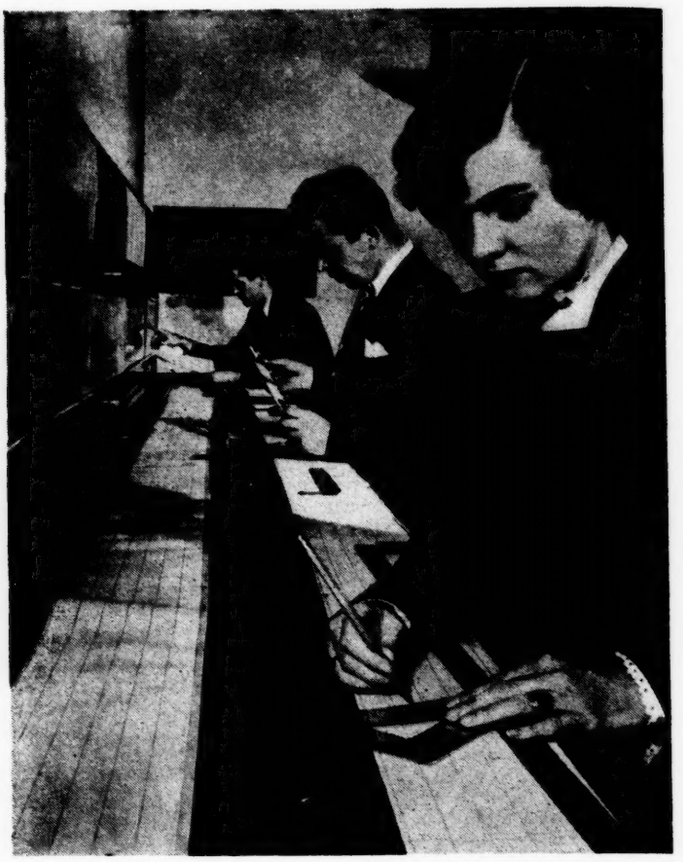
These new pumping stations, together with several others of an earlier type of construction, are located along a products pipeline extending from the company's refinery at Wood River, Ill., near St. Louis, eastward to Lima and Columbus, Ohio. Unlike a crude oil pipeline which handles only a single liquid, this line is equipped to carry to market up to twenty-two different finished petroleum products, pumped through the line one after the other.

Movement of products through these new stations is directed from a point hundreds of miles away. Electrically controlled pumps start and stop upon receipt of signals transmitted via teletype, and electrically motivated valves are made to open and shut in the same way. The most uncanny feature of the new system, however, is a set of meters which report to New York via teletype the suction and discharge pressures and electrical load of each station any time the teletype dial on the New York end asks for this information.

• **ONE MAN.**—The new stations are not wholly without the human touch, however. One man is assigned to each station to perform routine upkeep and maintenance, and to operate by hand any of the controls, if necessary. A siren is provided to summon the attendant in the event of such a necessity, and, like everything else at the station, it is set in motion by a man at a teletype machine in New York City.



Four pumping stations controlled from New York.



A 17 foot control board in Shell's New York office traces the progress of every gallon of oil product in the 450 mile pipe line in the Midwest. Shell dispatchers set markers and adjust charts to show where each product is, 24 hours a day.

• **PRODUCTS.**—The reason for central control of a products pipeline is the great variety of products which it handles. One after the other, gasoline, naphtha, kerosene, fuel oil, and other bulk products are pumped through the line. At convenient intervals, a portion of the products is taken off and put in tanks for distribution to local customers. Without scheduling of these take-offs from a central point, the operation of a products pipeline would be a hopeless muddle. At Shell's main office in New York, this work is handled by a central dispatching office connected by teletype to each station on this and two other lines which the company operates in other parts of the country.

The mechanism of the new automatic station was made possible by the co-operation of three other companies. General Electric provided the switch gear, controls and accessory equipment; American Telephone and Telegraph Co., the teletype relay equipment. The Bailey Instrument Co. developed the "telemeters" which make possible the automatic reporting of pressures and electrical loads.

• The world's largest reheat boiler to generate steam for electricity has been purchased by Consolidated Edison Co. of New York from the Babcock & Wilcox Co. A new station will be constructed in Astoria, Queens, to house the boiler. The first unit installed will cost $25 million. The new boiler will produce 1,200,000 lbs of steam per hour and will burn about 10,000 gph.

use these facts and

YOUR OWN FIGURES

TO LOWER AIR FILTERING COSTS

Cleanable filters vs. DUST-STOP replacement-type filters . . . which is the lower in cost? You needn't guess . . . it's easy to figure the answer accurately. Just insert your own figures in the analysis form contained in the DUST-STOP "Comparative Study of Air Filtering Costs in Central Systems"—see how you can save money with DUST-STOPS. Use the coupon below for your free copy.

As you know, rising labor costs have made filter cleaning more expensive, on the other hand, mass production has lowered the cost of DUST-STOP Filters. As the "Comparative Study" shows, a cleanable filter would have to last *up to 14 years* (on the basis of one 40¢ cleaning every 90 days) in order to bring its cost down to the cost of DUST-STOP Filters replaced at the same intervals. Furthermore, your DUST-STOP system is made "brand new" every time you change the filters.

Check your air filtering costs—
send for a copy of this study today.

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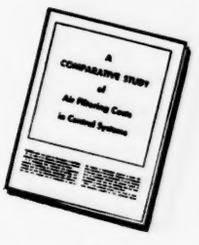
DUST STOP

AIR FILTERS

a FIBERGLAS* product

*DUST-STOP is the trade-mark of Owens-Corning Fiberglas Corporation for impingement-type air filters made of glass fibers. FIBERGLAS is the trade-mark (Reg. U.S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

Owens-Corning Fiberglas Corporation
Dept. 4I-H
Toledo 1, Ohio



Gentlemen: Please send me a copy of your "Comparative Study of Air Filtering Costs in Central Systems".

NAME _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

PLUMBING PROBLEMS

are reviewed in two-day training course at the University of Michigan.

The University of Michigan School of Public Health is offering a two-day inservice training course in plumbing problems September 15 and 16. This is the 36th in a series of such non-credit training courses offered by the School of Public Health. The course in plumbing problems is planned to develop some of the fundamental considerations involved in the more established practices as well as in newer problems in plumbing practice. It is given at the request of the Plumbing Inspectors' Association of Michigan.

• **SUBJECTS.**—Subjects covered in the course will include (1) theory and demonstrations of hydraulic principles used by the plumber; (2) safety precautions and safety devices used in control of flammable and toxic gases and liquids and for hot and cold water systems; (3) protective equipment for water supply systems, including vacuum breakers, back-flow preventers, and physical protection devices; (4) plumbing problems involved in disposal of trade wastes; (5) fundamentals of septic tank design and installation; (6) A discussion of a national uniform plumbing code, including historical background and present direction of promotion effort.

• **WHO.**—The course is designed especially for the benefit of plumbers, architects, engineers and sanitarians. However, other persons interested in the subject are welcome to attend. The enrollment fee is $5.00 and applications may be submitted in writing to H. E. Miller, School of Public Health, University of Michigan, Ann Arbor, Mich.

SLAB FLOORS

with foundations above frost-line to be studied by Small Homes Council.

When is it necessary to extend the foundation of a basementless house below frost-line?

To determine the answer to that question, the Small Homes Council of the University of Illinois is undertaking a one-year research project in cooperation with Levitt and Sons, Inc., builders and developers of the Levittown subdivision of Manhasset, New York. A research grant has been given to the University by Levitt and Sons, Inc., to carry out the project.

Announcement of the grant was made by J. T. Lendrum, acting director of the Small Homes Council, who will supervise the investigation.

• **WHY.**—While it is customary in northern areas to extend the foundation of a basementless house below the frost-line, the merits of this practice has never been subjected to research scrutiny. Since such construction is a major cost factor in a small house, it is believed that research might show how costs can be cut. In some areas, grade beam foundations (those which do not extend below frost) have been used successfully, but not under controlled conditions or scientific observation.

• **DATA.**—Under this project, weather action will be observed on a group of floor slabs which will be maintained under controlled drainage conditions. Data to be collected will include accurate measurements of vertical and horizontal slab movement. The relation between movement, weather, moisture and soil type will be determined, these being essential factors in establishing design or construction requirements.

A series of house-sized floor slabs and foundation walls, typical of those being used in small house construction, will be built at the Small Homes Research Center for purposes of the study. These will include concrete-block rim-walls with footings below frost-line, and thickened edge slabs or grade beams.

• **SET-UP.**—The slabs and foundations will be built in three identical groups. The first of these groups will represent recommended drainage practices (gravel fills, surface drainage). These will be on a well-drained area; the water table will be held below the frost-line. The second group of floor slabs and foundation walls will be identical in construction, but will be in an area protected by dikes and provided with water supply so the water table can be held close to the ground surface and above the frost-line. The third group will be under operating conditions similar to those for the second group, the variation being that the under-slab fill of coarse gravel will be replaced with fine sand or tamped earth.

Levels of the slabs will be read daily for vertical or horizontal displacement. Thermocouples will be used to measure the temperature of the ground below the slabs. Previous work in edge insulation of concrete slabs at the University indicates that heated structures with slab-on-ground floors have sufficient heat loss downward to protect the slab floor from frost.

• **ADVISORS.**—An advisory board for the project has been set up. Members of the board, who met recently in Washington, D. C., to review the project and test procedures, include: Laurence Shuman of the Technical Branch, Housing and Home Finance Agency; Harold Bills, Federal Housing Administration; W. H. Scheick, executive director of the Building Research Advisory Board; D. E. Parsons, chief of the Building Technology Division, National Bureau of Standards; W. E. Snow, Association of General Contractors; and Clark Daniel, National Association of Home Builders; all of Washington, D. C. Also I. G. Jalonack of Levitt & Sons, Inc., and Professor Lendrum.

WARM AIR

association expands field investigation program and university research.

An expanded field investigation program was approved at the National Warm Air Heating and Air Conditioning Association's semi-annual board of trustees' meeting on June 23 at the Statler Hotel, Cleveland, Ohio.

This SPARKLING SURFACE

Helps to Sell Your Jobs

Never underestimate the sales appeal in the gleaming good-looks of Bethlehem Galvanized Steel Sheets. Their clean, bright coating adds considerably to the appearance of any sheet-metal job.

But, important as appearance is, Bethlehem Galvanized Sheets have other noteworthy features that can't be detected by the eye alone. They have the strength and stiffness found only in steel. They have excellent workability and do not require special handling or unusual methods of fabrication. Long service life is assured by their tight uniform coating of Prime Western zinc.

As far as cost is concerned Bethlehem Galvanized Steel Sheets sell for considerably less than sheets of equal gages made from other metals.

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Steel Sheets

★ BETHLEHEM STEEL ★

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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.
Export Distributor: Bethlehem Steel Export Corporation.

• **FIELD.**—This program under the direction of C. W. Nessell, chairman of the field investigation committee, will include establishing of a mobile laboratory with a full-time investigation engineer to conduct continuous testing of heating systems already installed in homes throughout the country. This program will supplement the association's research program at the University of Illinois and will enable the association to obtain information on the heating efficiencies of various types of warm air systems under actual living and heating conditions across the country more rapidly than it can from formal laboratory research. The purpose of this project also is to learn in a more complete and detailed fashion the actual costs of construction, installation and operation of the newer types of warm air heating systems.

The results of this investigation project will be published in manual form as suggested procedures for the design and installation of the different systems that provide efficient operation from both the heating and cost standpoint.

It is planned to provide the investigator with a "sedan-delivery" type of automobile to transport the necessary testing apparatus which will include the latest in electronic recording devices.

• **UNIVERSITY.**—The board of trustees in reviewing the 1950 budget of the association approved increases to the consumer and industry publicity. An increase was also approved for the research program at the University of Illinois. The increase in the research budget is occasioned by a new test program which will be conducted in Research Residence 3 in connection with the operation of a warm air perimeter heating system. The additional expense is involved in changing the two-loop perimeter system which was investigated during the past heating season to a perimeter system using radial feeders so that comparison can be made between the two systems.

GERM-FREE AIR

a must at new Bethesda clinical center where laboratory workers will be protected by elaborate air conditioning.

In one laboratory in the Washington area, eleven scientists died and a hundred others became seriously ill from infectious diseases before the benefits of air conditioning were put into practice, the Refrigeration Equipment Manufacturers Association was informed by high government officials.

One of the most elaborate air conditioning units in the world will soon be installed at the National Institute of Health where a $40 million super-modern clinical center is now under construction.

• **PROTECTION.**—The air conditioner will serve as an effective precaution against the transference of deadly germs from one area to another. As in another recently constructed smaller laboratory at the Institute, great care will be taken in the installation of the air conditioning in order to guard the scientists and laboratory workers against sickness or loss of life.

Space has been allotted for hundreds of laboratory

STAINLESS STEEL

WHICH ALLOY FOR YOUR PIPING JOB?

Industry is rapidly turning to stainless steels as standard material for an increasing number of piping applications. Their ability to withstand the action of many corrosive agents, their toughness in sub-zero applications, their strength and ductility in elevated temperatures, and their high scaling-resistant properties, answer many tough piping problems.

Recent surveys show that 95% of the demand for stainless steel piping is in these three types:

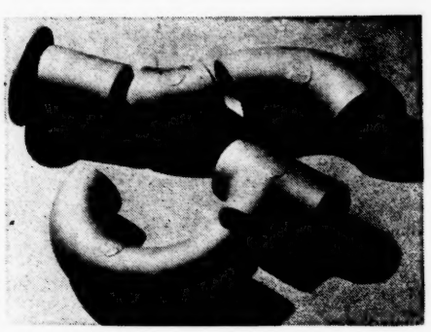
Type 304—18% chromium, 8% nickel
Type 347—18% chromium, 8% nickel, 1% Columbium
Type 316—18% chromium, 8% nickel, 2% Molybdenum

Each exhibits inherent qualities that make it ideal for certain applications. Thus, while the group as a whole covers 95% of industry's needs, individual applications should be studied carefully to determine which grade is best for the job.

For example, a prominent soap manufacturer's requirements are 10% Type 304, to eliminate product contamination—45% Type 347, to carry low temperature organic acids—and 45% Type 316, to carry the same acids at elevated temperatures.

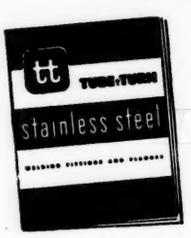
In the food and dairy industry, where the service is only mildly corrosive, the main reason for using stainless steel is to promote cleanliness and to eliminate contamination. Type 304 satisfies most of the demand here.

To provide the greater strength, greater safety and permanently leakproof joints of welded piping construction, Tube Turns, Inc. has developed a wide selection of types and sizes of welded fittings and flanges in all three grades of stainless steels listed above. It's the most complete line available today.



TUBE-TURN Stainless Steel Welding Fittings made of the three alloy types listed here, are available in a wide range of parts and sizes, including elbows, returns, tees, reducers, caps, lap joint stub ends, laterals and crosses. Flanges are also furnished.

NEW CATALOG



Write today for your free copy of the new Stainless Steel catalog, just published by Tube Turns, Inc. It contains the complete description of TUBE-TURN Stainless Steel Welding Fittings and Flanges, as well as valuable information on the use of stainless steel piping.

"Be Sure You See The Double tt"

TUBE TURNS, INC.
LOUISVILLE 1, KENTUCKY

In all the world there's only one TUBE-TURN Welding Fitting as shown by this trade mark... the right mark for every need in welding fittings and flanges.

TUBE-TURN

Your nearby TUBE TURNS' distributor can serve you right from stock. Call him for prompt delivery.

TUBE TURNS, INC., LOUISVILLE 1, KENTUCKY DISTRIBUTORS IN ALL PRINCIPAL CITIES

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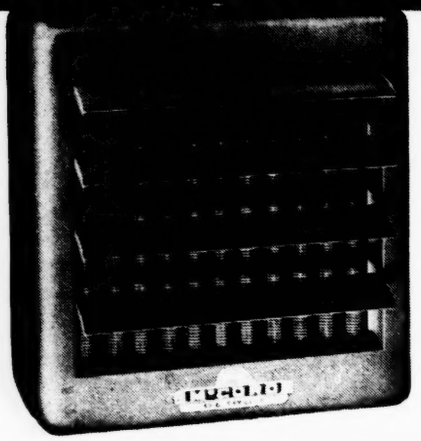
In Canada... Tube Turns of Canada Limited, Chatham, Ontario

McCORD

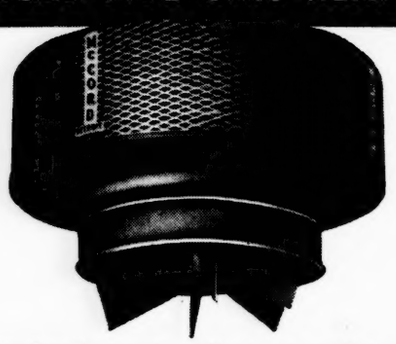
HEATING AND AIR CONDITIONING PRODUCTS

HORIZONTAL TYPE UNIT HEATERS



Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.

VERTICAL TYPE UNIT HEATERS



A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs. saturated steam pressure. Sizes to 575,000 B.T.U. capacity.

McCORD CORPORATION
DETROIT 11, MICH.

workers and helpers in six wings of the new building. Units will contain space for study of diseases in mice, rats, rabbits, guinea pigs, monkeys and other research animals. In each general laboratory unit there will be cubicles equipped with microscope tables and work benches.

• **STERILE.**—All air entering these small rooms will be filtered by strainers and sterilized by germicidal lamps. Air leaving the cubicles will pass over hot grids which will kill germs being blown into the outer air.

The air conditioning system will be so designed that all used air will be discharged to the outside atmosphere. Much of the dangerous work in the lab areas will be carried out under specially designed removable table hoods where the scientist will observe operations under the hoods through plate glass windows. Inside the hoods, a negative air pressure will be maintained and the outgoing air will pass over grids heated electrically to a temperature of from 500 to 650F, enough to destroy all air-borne germs.

• **AIR CHANGES.**—The laboratories will be furnished with 2.5 fresh air changes per hour with no recirculation of spent conditioned air, thus preventing any possibility of transfer of germs from one area to another. Window units will entrain secondary air from rooms and will produce 10 to 12 air turnovers per hour. Patients' rooms (500 beds) will be equipped with electric thermostat controls and laboratories with pneumatic thermostat controls.

Demountable units for walk-in refrigerated space will be utilized as a "room within a room" so that it can be relocated as the occasion arises in a reassignment of space.

• **RESEARCH.**—Among many other studies now being given special consideration by the National Institute of Health is that of environmental sanitation, which involves the advancement of air conditioning and equipment for food preparation and food service. The Institute also is conducting a further study in the design of chemical fume hoods in laboratory planning in air conditioned buildings.

• Graduate Division of the New York University College of Engineering will institute a new course called sanitary air analysis during the second term of the 1950-51 academic year.

• A series of technical meetings on natural gas heating for contractors and their representatives was held during May and June in nine Virginia communities. Meetings were promoted by the Virginia Associated Plumbing and Heating Contractors in preparation for new supplies of natural gas, which is being piped from mid-southern fields. Arrangements for meetings were made by American Radiator and Standard Sanitary Corp.

• The second corrosion short course (nine lectures in five days), under sponsorship of the National Association of Corrosion Engineers, will be held at Case Institute of Technology, Cleveland, Ohio, September 25 to 29. The first short course in September, 1949 was held at the University of Texas.

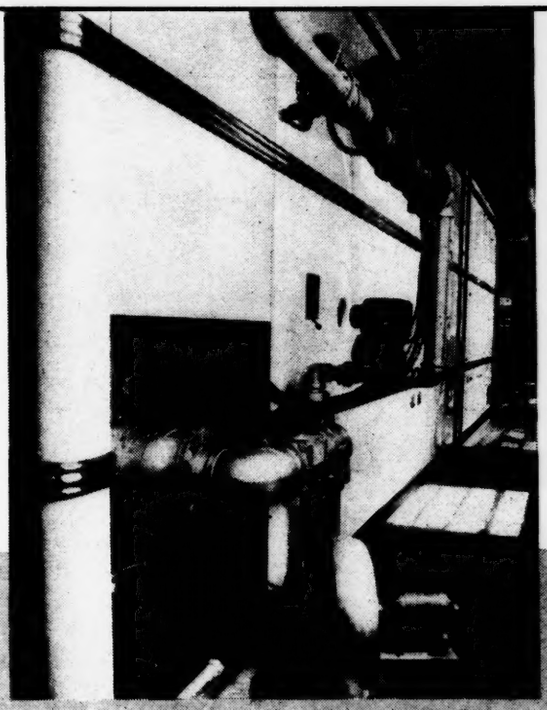
Bryant Industrial POW·R·SEMBLIES

Pre-engineered Packages for Controlled Gas Combustion

For firing air heaters, kilns, boilers and other appliances including ovens (shown here).

The Bryant Pow-R-Sembly is supplied in various arrangements of accessories to provide completely automatic, semi-automatic or manual operation. Capacities from 400,000 to 10,000,000 Btu per hour.

The Pow-R-Sembly can be adjusted for any type flame. Once set by simple, quick adjustment, it maintains constant flame characteristics. It is smooth-running and burns any low-pressure gas. Flanged connections permit arrangement in any desired position without extra equipment. Send for Data Sheet 7C-1a for complete information.



BRYANT INDUSTRIAL DIVISION
Affiliated Gas Equipment, Inc.
17825 ST. CLAIR AVENUE · CLEVELAND 10, OHIO

HYDROTHERM SCORES AGAIN!

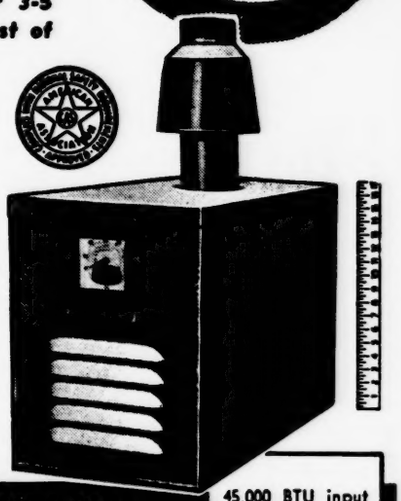
MODEL 2HW2

Supplies INDIVIDUALIZED Hot Water Heat For 3-5 Room Apts. Below Cost of Centralized Heating

Ideal for
- SMALL HOMES
- STORES
- TANK HEATING

Shipped Assembled — Requires no electrical connection. Compact size permits suspension from ceiling or shelf installation. AGA approved for all gases.

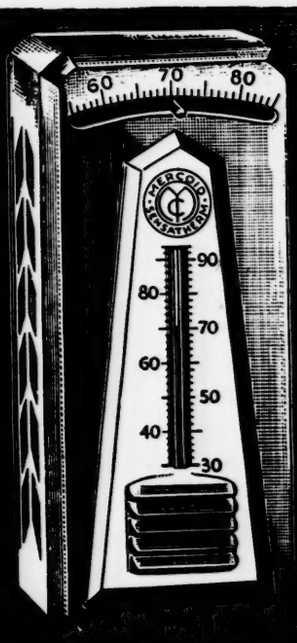
Write today for Bulletin 2HW2H



45,000 BTU input
13"x26"x17"
Weight 160 lbs.

HOOK & ACKERMAN, INC.
18 E. 41st Street New York 17, N. Y.

The Mercoid Sensatherm



IT HAS WHAT YOU NEED IN A THERMOSTAT

It maintains a home in ideal comfort at any desired temperature.
It operates on a variation of ½° above or below the point set.
It is a corrosion-proof mercury switch contact equipped control.
It performs perfectly for years without any servicing attention.
It is a masterpiece in mechanical precision, design and appearance.

Complete catalog sent upon request

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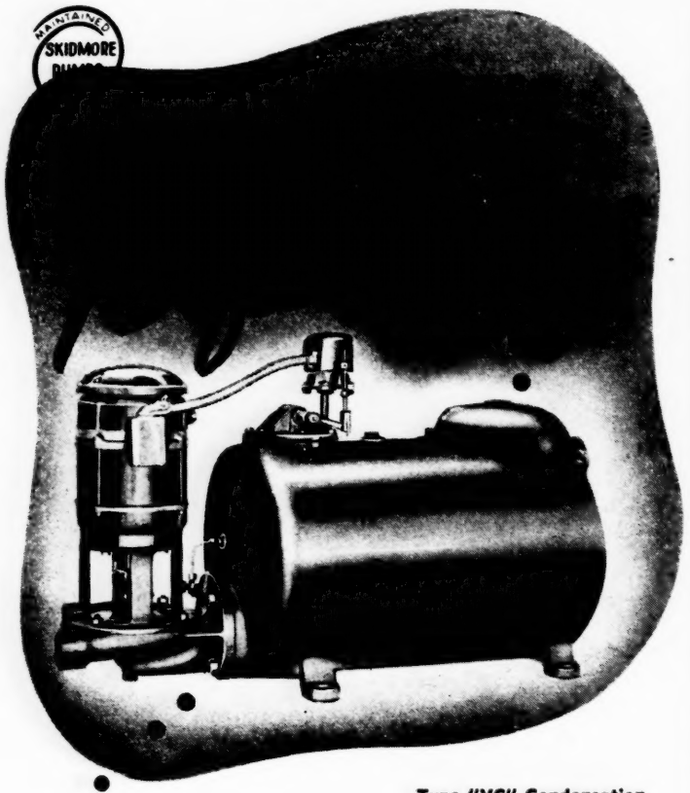
FOR HEATING, AIR CONDITIONING, AND INDUSTRIAL APPLICATIONS
THE MERCOID CORPORATION • 4201 BELMONT · CHICAGO 41 · ILL.



Type "VC" Condensation Pump and Receiver

LOW INLET CONNECTION

. . . eliminates recessed pits to accommodate low returns.

VERTICAL MOTOR CONSTRUCTION

. . . unsurpassed for performance and durability.

The Skidmore "VC" Condensate Pump is not only designed with all the very latest principles of sound pump engineering, but simplicity of design, as well, was not overlooked. The entire pump and motor unit may be removed for inspection without disturbing pipe connections.

Write for new bulletin No. 10-B giving complete details on the single and duplex "VC" Pumps.

Manufacturers of Quality Pumps for over a Quarter of a Century.

SKIDMORE PUMPS

ST. JOSEPH, MICHIGAN

(Concluded from page 100)

issued, to interpret and explain any provisions of the code and to keep it abreast of advancements in the field. American Society of Refrigerating Engineers, 40 W. 40th St., New York, N. Y. Price, $1.

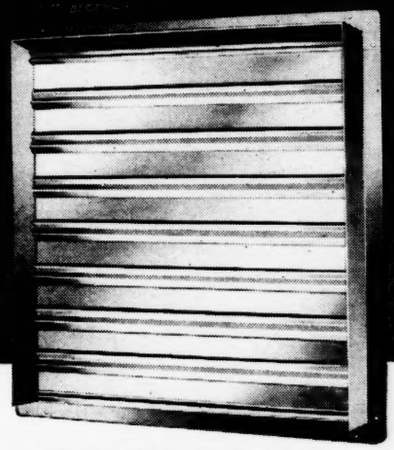
REPORT OF THE HOUSING AND HOME FINANCE AGENCY—The third annual report of the Housing and Home Finance Agency has just been published to cover the activities of this division. The material in this book is divided into four main divisions as follows: Over-all report of the Housing and Home Finance Agency, Office of the Administrator; Home Loan Bank Board; Federal Housing Administration; Public Housing Administration. Data are included on the various forms of housing insurance. In the last section there is a discussion of existing low rent housing and data on the Housing Act of 1949. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, $1.00.

INDUSTRIAL HYGIENE CONFERENCE—A 50-page bulletin has been issued by the Foundation which contains material that was presented in connection with its last annual meeting at Pittsburgh. This report summarizes legislative developments and workmen's compensation, state industrial hygiene codes, air pollution regulations, and trends in health and sickness disability benefits. A number of authors have contributed to this transaction, Bulletin No. 12. Industrial Hygiene Foundation, 4400 Fifth Avenue, Pittsburgh 13, Pa. Price, 75 cents.

RESISTANCE WELDING — The new edition of recommended practices for resistance welding has just been published. It is a modification and expansion of the standard that was originally issued in tentative form in 1946. Included are welding schedules for spot and seam welding of mild and medium carbon steels, low-alloy steels, stainless steels, nickel monel, Inconel and magnesium alloys. It contains recommended practices for projection welding for both low carbon and stainless steels, and considerable information of interest to anyone concerned with resistance welding. American Welding Society, 33 West Street, New York 18, N. Y. Price, $1.00.

SALES TRENDS IN HARDWARE STORES—The Bureau of Business Research of the Ohio State University has just issued another of its small business handbooks. It is on materials for checking up on sales trends in Ohio hardware stores. It shows how the individual store can use current trade statistics to aid its own management. It is one of the small handbooks that have been published for each of 17 kinds of retail business. Included in this book is the household appliance store, and the lumber-building materials dealers. This handbook contains 32 pages. Bureau of Building Research, The Ohio State University, Columbus 10, Ohio. Price, 50 cents.

they all want AIR-FLO



MODEL A-555

THE AUTOMATIC SHUTTER WITH ALL THE FEATURES

Front View—Closed

IT TAKES THE LOAD OFF THE FAN!

Aluminum louvers open fully, permitting capacity fan operation. New heavy reinforcement strip adds strength and long life to the louvers, assures quiet operation and perfect counterbalance, prevents rattling. Deep shroud protects shutter from high winds. Tie-rod, brackets and bearings inside frame, not exposed to weather. Special finish resists corrosion. Many other features.

Write for New Air-Flo Catalog 43-F

Illustrations and details of the complete Air-Flo line.

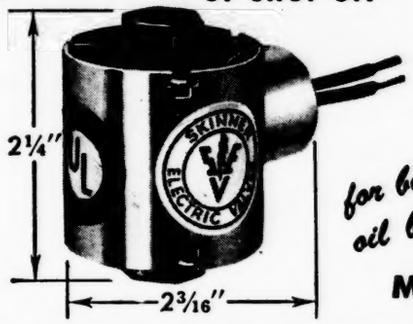
AIR CONDITIONING PRODUCTS CO.

2340 W. LAFAYETTE BLVD. • DETROIT 16, MICH.

ANNOUNCING

A NEW, LOW PRICED

Skinner **drip-eliminator or shut-off** ***Valve***



for better oil burner service!

Model V2-100

You can't beat the NEW V2-100 Solenoid Valve for dependability on original burner equipment or for service satisfaction. This very compact valve has such quality features as sturdy steel construction with all parts plated to resist corrosion — soft synthetic seat and seals to prevent leakage — spring loading for positive closing — *no* brazed, welded or soldered pressure *joints* — usable in any position — weight, only 9 oz. Maximum pressure is 125 p.s.i. The NEW V2-100 is two-way, normally closed, rated at 10 watts maximum and is Underwriters' approved.

Write for details and low prices!

Skinner **ELECTRIC VALVE DIV.**

THE SKINNER CHUCK COMPANY

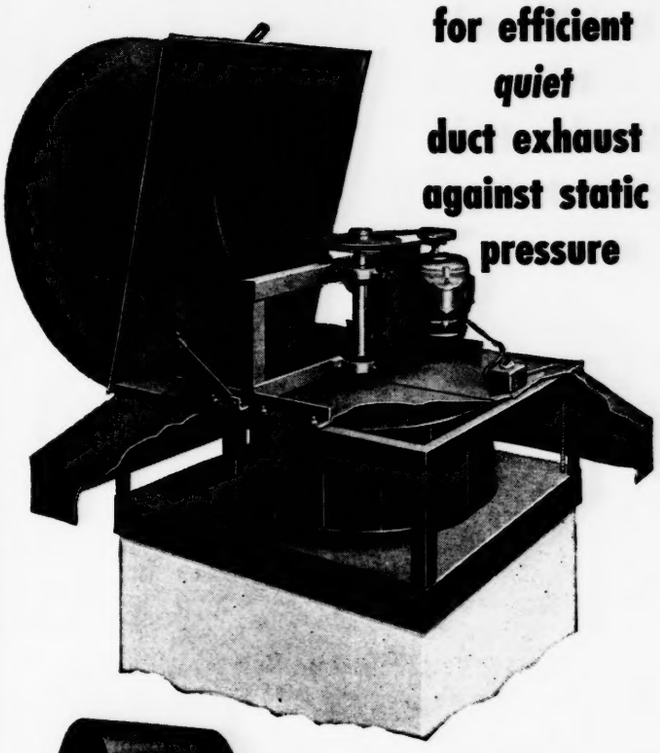
136 Belden Ave., Norwalk, Conn.

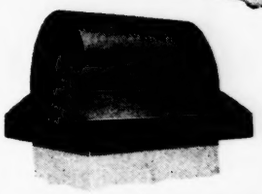
Swartwout *Announces* **The Airlift**

Completely engineered

Roof Ventilator

for efficient *quiet* duct exhaust against static pressure





This new duct exhaust ventilator brings you the quiet ventilation you've wanted for offices, schools, recreation halls and other applications. Airlift is powered by an unusually efficient centrifugal type fan unit having a streamlined inlet. Other structural features maintain Airlift's air moving effectiveness while operating at *very low noise levels.*

Airlift is made in a range of sizes and capacities covering all usual requirements. Powered by high quality motor; ball bearing fan shaft mounting; easily accessible for servicing.

For complete description of this new Airlift, write for Bulletin 341H.

18511 Euclid Avenue, Cleveland 12, Ohio.

The Swartwout Co.

Industrial Ventilation Specialists Since 1904

Equipment for *Controlled* Air Circulation

UTMOST SIMPLICITY
AND HEATING COMFORT
with SARCOTHERM

The heart of the Sarcotherm System is a simple mixing valve which has been proven in service for a quarter of a century. The mechanisms are strictly mechanical — no electricity or compressed air. Nothing could be simpler or more dependable.

NO "COLD SEVENTIES"

and no "on and off" control with Sarcotherm. It's a simple proportioning three way valve that mixes hot water from the boiler with the cooler return water, giving modulated control at all times.

RADIANT HEAT

Continuous circulation with modulated control is ideal. Inside control is by the exclusive Sarcotherm heat-loss thermostat. Thirty years of experience with Radiant Heating is built into every Sarcotherm job.

CENTRALIZED PANEL CONTROL SYSTEMS

Sarcotherm has available completely automatic centralized panel control systems for apartment houses, schools and other public buildings. Complete control programs furnished to suit particular requirements.

Architects and Heating Engineers like Sarcotherm because it is so flexible. Split systems, automatic night set-back and morning pick-up are easily arranged. Lower boiler temperatures, less fuel used and invariably a lower cost of installation, make Sarcotherm the ideal for engineers who are in daily competition.

Ask for the new catalog, engineering data and sales helps.

Sarcotherm

SARCOTHERM CONTROLS, INC. • Empire State Bldg. • NEW YORK 1, N. Y.

17

INDUSTRIAL DEGREE-DAYS
May and June, 1950

City	Number of Industrial Degree-Days			
	55F Base		45F Base	
	May	June	May	June
Baltimore, Md.	(a)	0	(a)	0
Buffalo, N. Y.	65	7	1	0
Chicago, Ill.	56	8	0	0
Cleveland, Ohio	36	3	0	0
Detroit, Mich.	42	2	2	0
Indianapolis, Ind.	6	0	0	0
New York, N. Y.	27	0	0	0
Philadelphia, Pa.	14	0	0	0
Pittsburgh, Pa.	6	0	0	0
St. Louis, Mo.	4	0	0	0

(a) Data not available.

Canadian Degree-Days for May, 1950*

City	May		Cumulative Sept. 1 to May 31	
	1950	Normal	1949-50	Normal
Calgary, Alta.	556	480	10258	9111
Charlottetown, P. E. I.	465	536	8175	8263
Crescent Valley, B. C.	480	403	8209	7731
Edmonton, Alta.	446	428	10887	9797
Fort William, Ont.	614	567	10747	10045
Grande Prairie, Alta.	505	505	11564	10122
Halifax, N. S.	450	493	7004	7395
London, Ont.	341	307	7390	7275
Medicine Hat, Alta.	406	301	9577	8495
Moncton, N. B.	440	474	8286	8568
Montreal, P. Q.	306	325	8173	8413
North Bay, Ont.	452	434	9584	9180
Ottawa, Ont.	329	310	8574	8674
Penticton, B. C.	335	273	7306	6346
Porquis Junction, Ont.	573	558	11326	11144
Prince George, B. C.	589	490	10231	8996
Quebec City, P. Q.	310	428	8590	9276
Regina, Sask.	519	434	11685	10891
St. John, N. B.	459	505	7691	8081
Saskatoon, Sask.	504	397	11832	10478
Toronto, Ont.	307	341	6778	7236
Vancouver, B. C.	412	326	5984	5303
Victoria, B. C.	428	366	5514	4935
Windsor, Ont.	239	251	6468	6705
Winnipeg, Man.	508	397	11529	10841

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.
The Department reports a slight revision in the figures for April as published in our June issue. Corrected figures are: Crescent Valley, B.C., 696; Montreal, P.Q., 779; Prince George, B.C., 876.

WHAT READERS SAY

Turning Vanes in Ducts

Editor, HEATING AND VENTILATING:

We are always interested in T. W. Reynolds' excellent articles appearing in the department, "Experience is My Classroom." While we generally agree with Mr. Reynolds, we were somewhat disturbed over the paragraph "Ducts Have Their Angles" in the May issue, as we feel that the reader may gain the impression that turning vanes in the elbow are of little value

and should be avoided by substitution of other construction where possible.

The duct turning vane was developed, not with the intention of supplanting the "good old-fashioned" elbow of ample sweep which Mr. Reynolds states was common in the old days, but rather for the more complicated and intricate duct systems necessitated by modern building construction. Here space is not generally available for elbows having generous sweeps and unless some measure is taken, such as the use of turning vanes to minimize resistance at these points, performance of the system may prove disappointing. These losses are additive and account for a major source of resistance to the flow of air, becoming increasingly important with the trend to increase duct velocities in an effort to conserve space and reduce construction costs.

The turning vanes selected may range from those made more or less by hand in the sheet metal shop to production assemblies consisting of scientifically designed and laboratory tested members providing the maximum in turning efficiency. The hand-made units are usually more expensive and often result in low turning efficiency due to the use of improperly developed contours, spacing, and other important factors difficult to control. The production units, on the other hand, add little to the cost of the duct system (some contractors state that the mitered elbow equipped with turning members costs but little if any more than the conventional elbow having the usual radius ratio), are uniformly designed, high in efficiency and may be selected with confidence from reliable engineering data. Their usefulness cannot be over-emphasized as they do much more than look pretty on the drawing, where a 90° turn must be made in limited space.

Where the old-fashioned elbow can be employed or angles of less than 90° used, we agree with Mr. Reynolds that the turning efficiency is equal or, in some cases, slightly better than the mitered elbow with turning vanes. They are not a cure-all but have a definite place in the modern duct system where the old-fashioned turns are not practical, and the use of turning vanes should be encouraged.

W. W. Kennedy,
Chief Engineer
Air Distribution Development
Barber-Colman Co.,
Rockford, Ill.

Although my first impressions were otherwise, a re-reading of Mr. Kennedy's letter seems to confirm what I originally wrote. Nothing said in the original item was intended or should be interpreted to cause anyone to avoid using turning vanes where they are conceded to be needed. Turning vanes certainly have their place and there are many places where they should be used. I use them frequently myself.

However, turning vanes are too commonly accepted as *always* good in *all* places and this mis-impression is one I am most concerned with. I do not know the complete history of the turning vane but I do know that turning vanes were formerly laboriously and inefficiently constructed by hand and were used where a

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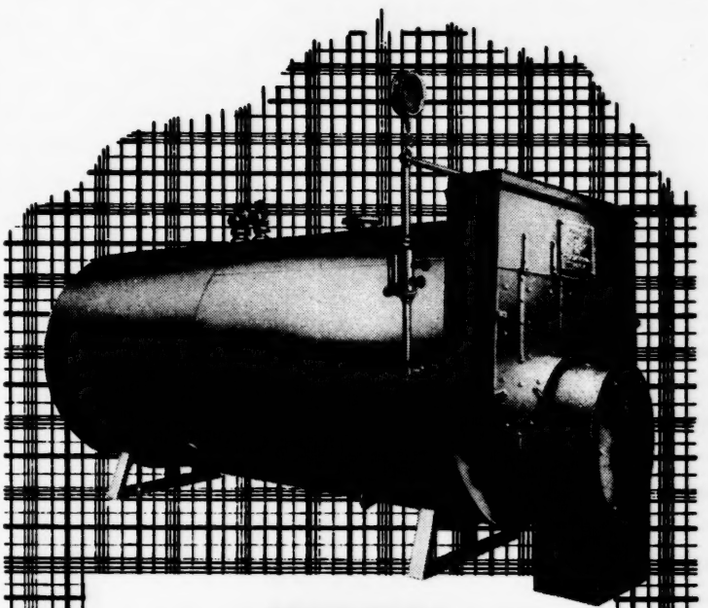
SCOTCH MARINE
all welded
HEATING BOILER



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19 STANDARD SIZES
for Oil, Gas and Coal Firing

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TITUSVILLE builds a complete line of ALL types of power and heating boilers—in all sizes and ratings. The All Welded Scotch Marine *Wet Back Top* Heating Boilers are an excellent example of using *age-old* principles with all the new modern design and welding developments. Get the complete information on TITUSVILLE BOILERS —dependable since 1860.

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Nicholson Traps

UP STEAM FLOW 50%

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A striking increase in steam flow from 2000 to 3000 lbs. an hour is reported by a chemical maker who recently replaced a mechanical trap with Nicholsons. This cut cooking time from 105 to 55 min., a gratifying speed-up of 48%. Also widely recommended for their effective venting of non-condensible gases in critical applications.

5 TYPES
for Every Plant Use

Process, heat, power. Sizes, ¼" to 2"; press. to 225 lbs. For details, send for our new

BULLETIN 450 or see Sweet's

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BLO-COLD INDUSTRIAL UNIT COOLERS

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*A new Acme product with outstanding features. Write for Catalog No. 40.

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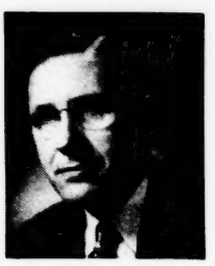
short turn elbow would otherwise have been required.

As one example of where turning vanes might be wrongly used, there is the application where they prevent access to the ducts for cleaning and are at the same time more or less unnecessary.

T. W. Reynolds.

. . . Since the Last Issue

At a meeting of the **Stoker Manufacturers Association,** the following officers were elected for the ensuing fiscal year, starting July 1, 1950: President, **C. T. Burg;** vice president, **L. C. Dubs;** secretary-treasurer, **T. A. Crawford;** executive secretary, **Marc G. Bluth** (appointive). Mr. Burg was also named chairman of the board of directors.



G. W. Hart

G. W. Hart has been appointed manager of advertising, sales promotion and sales training of **General Electric Company's Air Conditioning Department.** He succeeds **E. S. McKay,** who has joined the staff of Robert S. Peare, vice president in charge of the company's public relations. Prior to his appointment, Mr. Hart was manager of market research. From 1948 to March 1949, he was assistant to the marketing manager. A native of Pennsylvania, Mr. Hart was graduated from Bucknell University with a B.S. degree in electrical engineering in 1927. From 1929 to 1936 he was a commercial engineer with the Consolidated Edison Company in New York. For the following six years, he served as a sales and advertising consultant for Ebasco Services, Inc., New York. After serving three years in the U. S. Navy, he returned to civilian life with the rank of Lieutenant Commander, and was engaged as a management engineer with the management consultant firm of Booz, Allen and Hamilton, New York, until 1948.

Charles J. Ramsburg, Jr. has been appointed manager of sales, welded products, for the **Spang-Chalfant Division of The National Supply Co.** Mr. Ramsburg has been Pittsburgh district manager for Spang-Chalfant since January, and prior to that time was assistant district manager of the New York office.

A series of free factory training school sessions in conjunction with the Milwaukee School of Engineering is announced by **Perfex Corp.** of Milwaukee, manufacturers of automatic heating controls. The series began on Monday, July 10, and a new course starts every Monday for three days and is offered free to dealers and wholesalers, their servicemen and salesmen. Each 3-day course includes instruction in the fundamentals of heating, operation and servicing of heating controls for oil, gas and coal fired units, and a tour of the Perfex factory.

Automatic Firing Corp., St. Louis, has announced the appointment of **F. J. Hollerbach** as sales manager for the firm. A graduate of the University of Detroit, Mr. Hollerbach was sales manager of El Van Oyro, a Detroit corporation, and for several years was manager of the heating division of Sears, Roebuck & Co. in Michigan. He was eastern district representative for Automatic Firing Corp. in 1946 and 1947.

Mead W. Batchelor, until recently executive vice president of the Bridgeport Brass Co., has joined the **Chase Brass and Copper Co., Inc.** He will be located in Cleveland, Ohio, as works manager of the two plants operated by Chase in that city.

C. E. Buchholzer

Airtemp Division of Chrysler Corp. has announced the election of **Carl E. Buchholzer** as vice president and member of the board of directors of Airtemp Division. Mr. Buchholzer has been with Airtemp Division since the organization first moved to Dayton in 1936. As one of the first employees at the Dayton plant, he started to work as a job setter. In 1938 he was promoted to foreman in the machine shop and a year later moved up to general foreman of the entire machine shop. By 1941, when the plant converted to war work, Mr. Buchholzer was assistant general superintendent, and in 1944 he was made general superintendent. He held this position until November, 1948, when he was appointed manager of parts and service for the division. On February 1, 1950, Mr. Buchholzer was assigned to the president's staff.

C. H. Currier was elected president, and **W. C. Beekley,** vice president, at the annual meeting of **Tubular Exchanger Manufacturers Association, Inc.** held recently at Skytop, Pennsylvania. **George P. Byrne, Jr.** remains secretary-treasurer. Mr. Currier is president of Ross Heater & Mfg. Co., Inc., Buffalo, N. Y., a division of American Radiator & Standard Sanitary Corp. Mr. Beekley is president of Whitlock Mfg. Co., Hartford, Conn.

The board of directors of the **National Association of Fan Manufacturers, Inc.** at a meeting held in Detroit June 29, 1950, elected the following officers for the ensuing year: **E. E. Trickler,** president; **Edgar F. Wendt,** vice president; **L. O. Monroe,** secretary-treasurer. Mr. Trickler is vice president of The New York Blower Co., and Mr. Wendt is president of the Buffalo Forge Co.

The election of four additional officers has been announced by the board of directors of **Johnson Service Co.,** Milwaukee manufacturers of automatic temperature control systems. The new officers are: **Arthur J. Otto,** vice president; **Richard J. Murphy,** vice president and treasurer; **J. Rexford Vernon,** secretary; and **Louis V. Zacharyasz,** assistant secretary and assistant treasurer. All are of Milwaukee. A member of the board of directors for several years, Mr. Otto is factory superintendent and will continue to head the manufacturing operations of the company. Mr. Murphy, a veteran of 35 years with the Johnson organization, is also a director and was appointed secretary and assistant treasurer in 1938, and secretary and treasurer in 1946. Mr. Vernon, who has been with Johnson Service Company since 1923, has served as sales promotion manager since 1932 and was elected assistant secretary in 1946. Mr. Zacharyasz has headed the accounting department for many years.

Acme Industries, Inc. has announced that **Carl Millsom** has joined Acme as manager of the Flow-Cold Division and will direct sales on the Flow-Co'd liquid chiller and the Model TCJ cooling towers.

B. A. Irvin

Bruce A. Irvin, vice president and general manager of the **Hammel-Dahl Co.,** Providence, R. I., was fatally injured on June 14, 1950, as a result of an automobile accident. Mr. Irvin was 48 years old and was a graduate of the University of Michigan in 1923. For more than 20 years he was actively engaged in the design and development of automatic flow control valves in the chemical, petroleum and process industries. He had been associated with the Hammel-Dahl Co., diaphragm control valve manufacturers, since 1946. During the war years he was secretary of the Materials Co-ordinating Committee of the Petroleumn Administration, and was chief of the P.A.W. Materials Requirements Section.

CONVECTOR Elements

COPPER TUBE, ALUMINUM FIN, CAST HEADERS

POSITIVE FIN TO TUBE THERMAL BOND

RIGID CONSTRUCTION

EASY MOUNTING

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BLOWERS

Air Conditioning Furnace Blower Assembly. Designed for manufacturers of warm air furnaces and Air Conditioning equipment.
Wheel Sizes 7½" to 27"

Housing Sides—Cutoff Plate and scroll Sheet.

Heavy gauge steel stampings.

End Spider suspension type wheel assembly.

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MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK Mfg. Co.
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Brownsville Houses

New York City

Beginning with the February, 1949 issue of HEATING AND VENTILATING we have talked about nothing but Therm-O-Tile jobs in New York City alone—in the huge housing projects in that city. Above we show the Brownsville Houses, one of the many New York jobs in which Therm-O-Tile Underground Steam Conduit was specified.

Bulletin 381 explains fully why efficient and economical Therm-O-Tile is preferred in large central heating projects such as the above. Ask for a copy.

H. W. PORTER & CO., Inc.
823-V Frelinghuysen Ave. Newark 5, N. J.

Kennard Corp., St. Louis manufacturers of heat transfer equipment, announces that a second plant expansion in the last six months is nearly complete. The first addition, completed last April, added 40% to the plant's production space. This latest addition will increase it another 30%. Both additions, of modern fireproof construction, air conditioned throughout, enable more efficient material flow and stream-lined assembly lines to increase the productive capacity far more than the percentage of space increase.

V. W. Farris has announced the formation of **Farris Stacon Corp.** to purchase the Edison Stacon Regulating Valve Division from Thomas A. Edison, Inc. (Instrument Division). Mr. Farris, president of the Farris Engineering Corp. among other enterprises, will carry on manufacture of the regulator. The newly formed company will service present users of Stacon regulators and controllers.

Kritzer Radiant Coils, Inc., announces the appointment of **Mel W. Knight** as general sales manager and **C. G. Newton** as chief engineer.

Mr. Knight has spent the past 17 years as general sales manager of Peerless of America, Inc., and, prior to that, was associated with both Kelvinator and Servel, Inc. During the years of 1939, 1940 and 1941, Mr. Knight served as

C. G. Newton

M. W. Knight

chairman of the All Industry Exposition sponsored by the Refrigeration Equipment Manufacturers Association.

Mr. Newton, from 1932 and until joining the Kritzer organization, was vice president and chief engineer of the Kehm Corp., manufacturers of boilers, furnaces and other heating units and specialties. The numerous developments covered by patents issued to Mr. Newton attest to the many contributions he has made to the heating industry.

Remington Air Conditioning Division of Remington Corp., Cortland, N. Y., has announced its acquisition of a much larger manufacturing plant in Auburn, N. Y. Remington sales and general offices and the bulk of Remington manufacturing operations will be moved to the new plant November 1 this year. Remington's new Auburn factory, which was acquired from the Industrial Development Committee of the Auburn Chamber of Commerce, was formerly a part of the Auburn Works of International Harvester. Usable floor space is more than six times that of Remington's present Cortland plant.

Borg-Warner Corp. has announced the elevation of **C. S. Davis, Jr.**, to the presidency of the corporation's **Norge Heat Division**, with central offices in Detroit. Mr. Davis formerly was vice president and general manager of Norge Heat. Previously the chief executive of the division was G. P. F. Smith, who has relinquished this post to devote full time to his duties as president of the Norge Division. Mr. Davis, after graduation from Princeton in 1936, began his industrial career as a chemist with Marbon Corp., a Borg-Warner subsidiary. He is a son of C. S. Davis, chairman of the board of Borg-Warner. The promotion of **W. F. Krueger**, of Detroit, from assistant treasurer to secretary and treasurer of Norge Heat also was announced. Mr. Krueger came to Norge Heat from the Ford Motor Co. in 1948.

Acme Industries, Inc., of Jackson, Mich., announces that the president of the concern, **Roy C. Weatherwax**, after an illness of several months, died at the W. A. Foote Memorial Hospital in Jackson on June 23, 1950. Mr. Weatherwax was a life-long resident of Jackson, and one of the original incorporators of Acme Industries, Inc., in 1919. As a young man he was a member of the Holton-Weatherwax Co. and later was an organizer and member of several other industrial corporations. **Kenneth A. Weatherwax**, who for the last ten years has been executive vice president of Acme Industries, Inc., has been elected president of the company.

Worthington Pump and Machinery Corp. has announced that **Charles A. Butcher** joined the organization June 1st as assistant to the president. Mr. Butcher formerly was general manager of Crocker-Wheeler Electric Manufacturing Co., and vice president of its successive parent companies, Joshua Hendy Corp. and Elliott Co. He will make his headquarters at 2 Park Ave., New York, N. Y.

Controlling stock of **The H. K. Ferguson Co.**, industrial engineers and builders, has been purchased by **Morrison-Knudsen Co., Inc.**, from the Oman interests of Nashville, Tenn., according to a joint announcement made in Cleveland. **Otto F. Sieder** will continue as executive vice president and general manager of The H. K. Ferguson Co. and there will be no change in the management, personnel or policy of the company.

Election of **Krantz Keller** as treasurer and appointment of **M. C. Aspholm** as comptroller of **Carrier Corp.** have been announced. Mr. Keller joined Carrier in 1942 as a tax accountant, after 13 years with the Chase National Bank and Chase Securities Corp. in New York, and since 1944 has been manager of Carrier's tax department. Mr. Aspholm started with Carrier in 1937 as an accountant and was named head of the department of statistics and budgets in 1944. He became assistant comptroller two years later.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

CHEMICAL EXPOSITION—Sixth National Chemical Exposition of the American Chemical Society, at the Coliseum, Chicago, Ill. James J. Doheny, 1155 Sixteenth St., N.W., Washington 6, D. C. ..... **SEPTEMBER 5-9, 1950.**

INSTRUMENT CONFERENCE—5th national instrument conference and exhibit, of The Instrument Society of America, at Memorial Auditorium, Buffalo, N. Y. Richard Rimbach, executive secretary of the Society, 921 Ridge Ave., Pittsburgh 12, Pa. ..... **SEPTEMBER 18-22, 1950.**

INTERNATIONAL ENGINEERING CONGRESS — Third International Mechanical Engineering Congress, sponsored by The British Engineers' Association, to be held in Brussels, Belgium. A. W. Berry, Director of Association, 32 Victoria St., London, S.W. 1, England. ..... **SEPTEMBER 18-23, 1950.**

PETROLEUM CONFERENCE—Petroleum Mechanical Engineering Conference, at Hotel Roosevelt, New Orleans, La. Secretary, American Petroleum Institute, 50 W. 50th St., New York, N. Y. ..... **SEPTEMBER 25-27, 1950.**

AGA CONVENTION AND EXPOSITION—Biennial Exposition of Gas Appliances and Equipment, in conjunction with 1950 annual convention of the American Gas Association, at Convention Hall, Atlantic City, N. J. Secretary, AGA, 420 Lexington Avenue, New York 17, N. Y., and secretary, Gas Appliance Manufacturers Association, 60 E. 42nd St., New York 17, N. Y. ..... **OCTOBER 2-6, 1950.**

(concluded on page 134)

Now... A COMPLETE LINE *of*

INDUSTRIAL SELF-CONTAINED UNIT HEATERS

For Any Application

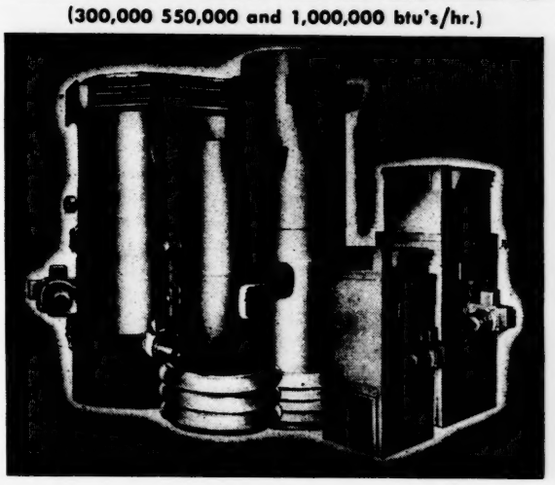
THERMOPAC

(100,000 and 200,000 btu's/hr.)

HORIZONTAL SUSPENSION OR FLOOR SET

THERMOBLOC

(300,000 550,000 and 1,000,000 btu's/hr.)

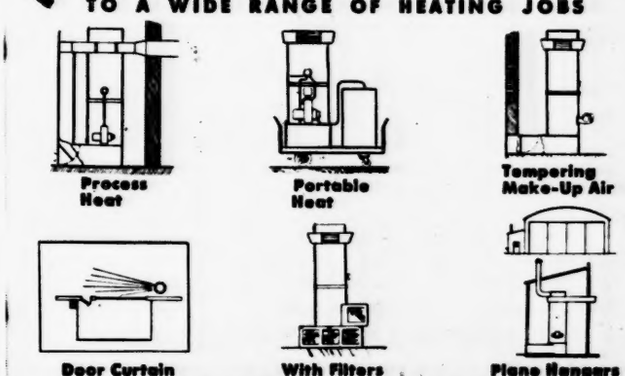


The fundamental principles of high heat transfer, simplicity and completely automatic operation have been incorporated in three new units, augmenting the two basic THERMOBLOCS that have been so well accepted. These five units offer a complete range of 100,000, 200,000, 300,000, 550,000 and 1,000,000 btu's/hr., filling every application from the smallest to the largest plant requiring multiple installations. And, THERMOBLOCS are completely automatic in operation, need no attendant.

THERMOBLOC is the ideal heater for buildings with large, unobstructed areas; freight terminals, machine shops, assembly lines and the like. Silent THERMOBLOCS are used in super markets, dance halls, auditoriums. Standard units are adaptable to many unusual heating applications, as shown below. Better get the whole story on THERMOBLOC, the most useable direct-fired heater on the market.

Write for the new data book containing tables and engineering data on heating constants, building materials, etc. It will aid you in determining the heating requirements of your plant. To solve your heating problems, call our engineers and let them show you the many advantages of THERMOBLOC.

STANDARD THERMOBLOCS ARE ADAPTABLE TO A WIDE RANGE OF HEATING JOBS



THERMOBLOC DIVISION

PRAT-DANIEL CORPORATION

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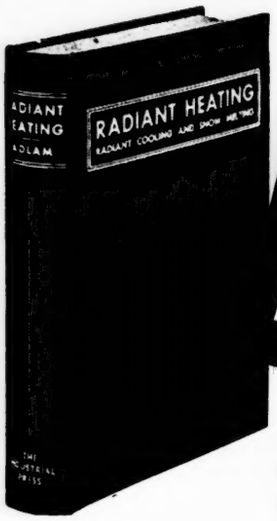

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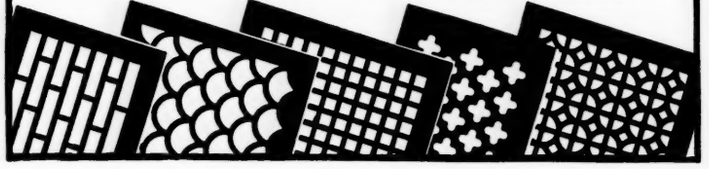

(Concluded from page 133)

METALS MEETING—Annual meeting of the American Society for Metals, in Chicago, Ill. For hotel and other details, write W. H. Eisenman, national secretary, 7301 Euclid Ave., Cleveland 3, Ohio. .....**OCTOBER 23-27, 1950.**

WELDING MEETING—Annual meeting of the American Welding Society, in Chicago, Ill. For hotel and other details, write J. G. Magrath, national secretary, 33 W. 39th St., New York 18, N. Y. .....**OCTOBER 23-27, 1950.**

REFRIGERATION WEST COAST EXHIBIT—West Coast Educational Exhibit and Conference, of the Refrigeration Equipment Manufacturers Association, at Municipal Auditorium in Long Beach, Calif., to be held simultaneously with 5th annual convention of the Refrigeration & Air Conditioning Contractors Association. Edna Berggren, executive secretary, 228 No. La Salle St., Chicago 1, Ill. .....**NOVEMBER 17-19, 1950.**

POWER SHOW — 19th National Exposition of Power and Mechanical Engineering, sponsored by the American Society of Mechanical Engineers, in conjunction with the society's annual meeting, at Grand Central Palace, New York, N. Y. Charles F. Roth, president, International Exposition Company, Grand Central Palace, New York.....**NOVEMBER 27—DECEMBER 2, 1950.**

ASRE MEETING—Annual convention of the American Society of Refrigerating Engineers, at Hotel Commodore, New York. M. C. Turpin, secretary, 40 W. 40th St., New York 18, N. Y. .....**DECEMBER 3-6, 1950.**

PLANT MAINTENANCE SHOW AND CONFERENCE—2nd plant maintenance show and conference, at the Auditorium, Cleveland, Ohio. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. .....**JANUARY 15-18, 1951.**

ASHVE MEETING—57th annual meeting of the American Society of Heating and Ventilating Engineers, at the Bellevue-Stratford, Philadelphia, Pa. A. V. Hutchinson, secretary of the Society, 51 Madison Ave., New York 10, N. Y. **JANUARY 22-25, 1951.**

ASHVE EXPOSITION—10th International Heating and Ventilating Exposition under the auspices of the American Society of Heating and Ventilating Engineers, at the Commercial Museum, Philadelphia, Pa. Charles F. Roth, manager of the International Exposition Company, Grand Central Palace, New York 17, N. Y. .....**JANUARY 22-26, 1951.**

FOUNDRYMEN'S CONVENTION—55th annual convention of the American Foundrymen's Society, in Buffalo, New York. William W. Maloney, secretary-treasurer of the Society, 616 S. Michigan Ave., Chicago 5, Ill. .....**APRIL 23-26, 1951.**

REFRIGERATION MEETING—Annual meeting of the Refrigeration Equipment Manufacturers Association, at The Homestead, Hot Springs, Va. George E. Mills, public relations director, REMA, 1346 Connecticut Ave., N.W., Washington, D. C. .....**APRIL 30—MAY 2, 1951.**

NDHA MEETING—42nd annual meeting of the National District Heating Association, at the Statler Hotel, Detroit, Mich. John F. Collins, Jr., secretary-treasurer of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa.....**JUNE 5-8, 1951.**

INSTRUMENT CONFERENCE AND EXHIBIT—1951 Instrument conference and national exhibit of the Instrument Society of America, at the Coliseum, Houston, Tex. John McCaffery, assistant executive secretary of the Society, 921 Ridge Ave., Pittsburgh 12, Pa. .....**SEPTEMBER 10-14, 1951.**

REFRIGERATION SHOW—7th All-Industry Refrigeration and Air Conditioning Exposition, at Navy Pier, Chicago, Ill. Show director, REMA, 1346 Connecticut Ave., N.W., Washington, D. C. .....**NOVEMBER 5-9, 1951.**

Bind in

MISCELLANEOUS HEAT LOSSES IN FLUE GAS

A series of charts for determining the *sensible* heat loss in stack gases with a wide variety of fuels has appeared on previous data sheets. There are other losses in the flue gas, as follows:

Heat Lost Due to Moisture. This consists of heat lost in three separate categories: (1) the heat lost due to combustion of hydrogen (other than that in moisture in the fuel) and, consequently, high in fuels with a high hydrogen content; (2) heat lost due to moisture in the fuel, and (3) heat lost due to superheating the moisture in the air.

Hydrogen in the fuel combines, in combustion, with oxygen to form water vapor. Each pound of hydrogen liberates 61,000 Btu per lb. If the flue gases were cooled back to the temperature of the entering air and the water vapor condensed, all this heat would be recovered. Since they are not, there is heat loss due to (1) the latent heat to evaporate the moisture and (2) the heat necessary to superheat the moisture to the flue gas temperature.

The *loss due to combustion of hydrogen* is:

$$H_h = 9H\ (1030.7 + .455\ t_s)$$

where the temperature of air supplied is assumed at 60F,

H_h = heat loss due to combustion of hydrogen in Btu *per pound of fuel*,

H = percent of hydrogen by weight in fuel expressed as decimal, and

t_s = temperature of flue gas, F.

Example. A fuel oil analysis shows 86% carbon and 14% hydrogen. What is the heat lost due to combustion of this hydrogen if the flue gas temperature is 600F?

Solution.

$$H_h = 9 \times .14\ (1030.7 + .455 \times 600)$$
$$= 1642.7 \text{ Btu per lb of fuel}$$

If it were possible to maintain the flue gases at room temperature, the hydrogen loss would be

$$H_h = 9522 \times .14 = 1333.1 \text{ Btu per lb of fuel}$$

Heat *lost due to moisture in the fuel* is

$$H_m = W\ (1030.7 + .455\ t_s)$$

where

H_m = heat lost in Btu per pound of fuel and due to moisture in the fuel,

W = percent of moisture in the fuel by weight, expressed as a decimal, and

t_s = temperature of flue gases, F.

Example. A proximate analysis of a coal shows a moisture content of 10.72%. What is the fuel moisture loss when the flue gas temperature is 850F?

Solution. The loss is

$$H_m = .1072\ (1030.7 + .455 \times 850)$$
$$= 152 \text{ Btu per lb of coal.}$$

The heat *lost due to moisture in the air* is usually small and is:

$$H_a = .455_m\ (t_s - 60)$$

where

H_a = heat lost due to moisture in the air, Btu per lb of fuel,

m = weight of moisture in air supplied in pounds per pound of fuel,

t_s = temperature of flue gases, F.

Example. What is the heat loss per pound of fuel for a fuel when 18.5 lb of air is being supplied per pound of fuel, the temperature of the flue gas is 600F, and the air supplied is at 80F dry bulb and 75% relative humidity?

Solution. From psychrometric tables, the weight of saturated vapor per pound of dry air at 80F is 155.52 grains; at 50% R. H. the weight would be 77.76 grains per lb. For 18.5 lb of air, the weight of moisture would be $77.76 \times 18.5 = 1438.6$ grains

or $\dfrac{1438.6}{7000} = 0.206$ lb.

Therefore

$$H_a = .455 \times .206\ (600 - 60)$$
$$= 50.6 \text{ Btu per lb of fuel.}$$

Heat Lost Due to Carbon Monoxide. When carbon is burned in the presence of insufficient oxygen, carbon monoxide is formed. The burning of carbon to completion yields carbon dioxide, and the difference in heat between the two reactions represents a loss if CO is present in the flue gas. This loss is

$$H_c = 10{,}190\ C \frac{CO}{CO + CO_2}$$

where H_c = loss in Btu *per lb* of solid or liquid fuel, or per *cu ft* of gas,

CO and CO_2 = percent of CO and CO_2, respectively, in flue gas by volume, and

C = weight of carbon burned in pounds per pound of fuel.

With oil, the value of C is the percentage of carbon in the ultimate analysis of the fuel, expressed as a decimal, since the analysis is on a weight basis, and there is no ash. With coal, however, the value of C would be the weight of carbon in the fuel less the carbon remaining in the ash, so that for coal

$$C = C_f - AC_a$$

where C_f = percentage of carbon in the coal from the ultimate analysis, expressed as a decimal,

A = pounds of ash per pound of coal burned, and

C = percentage of ash which is carbon, expressed as a decimal.

In the case of gas, the analysis of the fuel is on a volume, not a weight, basis. Therefore, the weight of carbon per cubic foot of fuel must be calculated.

For a given fuel, the loss due to CO is frequently given in percent of the heating value of the fuel (gross heat value for gases, net for coal and oil), or